



## **SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE**

**(Autonomous)**

[An Autonomous College Affiliated to Periyar University, Salem, Tamil Nadu]

[Accredited by NAAC with 'A' Grade with CGPA of 3.27]

[Recognized 2(f)& 12(B) Statuvs under UGC Act. 1956]

**Katteri – 636 902, Uthangarai (Tk), Krishnagiri (Dt)**

**Tamil Nadu, India**

**Website:www.svmcugi.comE-mail:svmzoologyug@gmail.com**



### **BACHELOR OF SCIENCE IN ZOOLOGY**

### **CHOICE BASED CREDIT SYSTEM (CBCS&OBES)**

### **REGULATIONS AND SYLLABUS FOR**

### **B.Sc. ZOOLOGY PROGRAMME**

### **(SEMESTER PATTERN)**

**(For Students Admitted in the College from  
the Academic Year 2020-2021 Onwards)**



### Programme Outcomes (POs)

|            |   |
|------------|---|
| <b>PO1</b> | Apply the knowledge of various branches of Zoology and General biology meant both for a graduate terminal course and for higher studies.  |
| <b>PO2</b> | Acquire basic skills in the observation and study of nature, biological techniques, experimental skills and scientific investigation.   |
| <b>PO3</b> | Learning handling DNA sequence data and its analysis which equip students to get employed in R&D in the industry involved in DNA sequencing services, diagnostics, and microbiome analysis. |
| <b>PO4</b> | Development of theoretical and practical knowledge in handling the animals and using them as model organism   |
| <b>PO5</b> | Development of an understanding of zoological science for its application in medical entomology, Apiculture, Aquaculture, Agriculture and Modern medicine.                                  |

### Programme Specific Outcomes (PSOs)

|             |  |
|-------------|--|
| <b>PSO1</b> | Identify and list out common animals in vertebrate and non-vertebrate<br>Explain various physiological and biochemical changes in human  |
| <b>PSO2</b> | Students can apply the knowledge and relate the information gained from the allied subjects viz; Botany and Chemistry, to explain and conclude through the Interdisciplinary approaches. |
| <b>PSO3</b> | The students enhance knowledge on the pathways of metabolisms and Explain the role and impact of different environmental conservation programmes   |
| <b>PSO4</b> | Understanding the importance of genetic engineering new tools  |
| <b>PSO5</b> | Identify animals beneficial to humans and Use tools of information technology for all activities related to zoology  |



## SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

**Bachelor of Science (B.Sc.) in Zoology**

**Programme Pattern and Syllabus (CBCS)**

(For Students Admitted in the College from the Academic Year 2020-2021 Onwards)

| Sl. No.            | Part               | Nature of the Course | Subject Code                   | Title of the Paper                | Hours / Week | Credits   | Marks      |            |            |
|--------------------|--------------------|----------------------|--------------------------------|-----------------------------------|--------------|-----------|------------|------------|------------|
|                    |                    |                      |                                |                                   |              |           | CIA        | ESE        | Total      |
| <b>SEMESTER-I</b>  |                    |                      |                                |                                   |              |           |            |            |            |
| 1                  | I                  | Language             | 20UTA1F01                      | Tamil - I                         | 6            | 3         | 25         | 75         | 100        |
| 2                  | II                 | Language             | 20UEN1F01                      | English-I                         | 6            | 3         | 25         | 75         | 100        |
| 3                  | III                | Core-I               | 20UZO1C01                      | Invertebrate I                    | 5            | 5         | 25         | 75         | 100        |
| 4                  |                    | Allied-I             | 20UCH1A01                      | Allied Chemistry - I              | 5            | 4         | 25         | 75         | 100        |
|                    |                    |                      | 20UBO1A01                      | Allied Botany - I                 |              |           |            |            |            |
| 5                  |                    | Core Practical-I     | 20UZO2P01                      | Lab Course-I (Covering core I-II) | 3            | -         | -          | -          | -          |
| 6                  |                    | Allied Practical-I   | 20UCH2AP01                     | Allied Chemistry Lab Course-I     | 3            | -         | -          | -          | -          |
|                    | 20UBO2AP01         |                      | Allied Botany Lab Course-I     |                                   |              |           |            |            |            |
| 7                  | IV                 | Value Education      | 20UVE101                       | Yoga                              | 2            | 2         | 25         | 75         | 100        |
| <b>Total</b>       |                    |                      |                                |                                   | <b>30</b>    | <b>17</b> | <b>125</b> | <b>375</b> | <b>500</b> |
| <b>SEMESTER-II</b> |                    |                      |                                |                                   |              |           |            |            |            |
| 8                  | I                  | Language             | 20UTA2F02                      | Tami l- II                        | 6            | 3         | 25         | 75         | 100        |
| 9                  | II                 | Language             | 20UEN2F02                      | English -II                       | 6            | 3         | 25         | 75         | 100        |
| 10                 | III                | Core-II              | 20UZO2C02                      | InvertebrateII                    | 5            | 5         | 25         | 75         | 100        |
| 11                 |                    | Allied-II            | 20UCH2A02                      | Allied Chemistry - II             | 5            | 3         | 25         | 75         | 100        |
|                    |                    |                      | 20UBO2A02                      | Allied Botany - II                |              |           |            |            |            |
| 12                 |                    | Core Practical-I     | 20UZO2P01                      | Lab Course-I (Covering core I-II) | 3            | 4         | 40         | 60         | 100        |
| 13                 | Allied Practical-I | 20UCH2AP01           | Allied Chemistry Lab Course-II | 3                                 | 3            | 40        | 60         | 100        |            |



|                     |                         |                      |                                     |   |           |           |            |            |            |
|---------------------|-------------------------|----------------------|-------------------------------------|---|-----------|-----------|------------|------------|------------|
|                     |                         |                      | 20UBO2AP01                          | Allied Botany Lab<br>Course-II          |           |           |            |            |            |
| 14                  | IV                      | Common<br>Paper      | 20UES201                            | Environmental Studies                   | 2         | 2         | 25         | 75         | 100        |
| <b>Total</b>        |                         |                      |                                     |   | <b>30</b> | <b>23</b> | <b>205</b> | <b>495</b> | <b>700</b> |
| <b>SEMESTER-III</b> |                         |                      |                                     |   |           |           |            |            |            |
| 15                  | I                       | Language             | 20UTA3F03                           | Tami I- III                             | 5         | 3         | 25         | 75         | 100        |
| 16                  | II                      | Language             | 20UEN3F03                           | English –III                            | 5         | 3         | 25         | 75         | 100        |
| 17                  | III                     | Core-III             | 20UZO3C03                           | Chordata                                | 5         | 5         | 25         | 75         | 100        |
| 18                  |                         | Allied –III          | 20UCH3A03                           | Allied Chemistry - III                  | 5         | 4         | 25         | 75         | 100        |
|                     |                         |                      | 20UBO3A03                           | Allied Botany - III                     |           |           |            |            |            |
| 19                  |                         | Core<br>Practical-II | 20UZO2P02                           | Lab Course-II (Covering<br>core II-III) | 3         | -         | -          | -          | -          |
| 20                  | Allied<br>Practical-III | 20UCH4AP02           | Allied Lab Course-III<br>Chemistry  | 3                                       | -         | -         | -          | -          |            |
| 21                  |                         | 20UBO4AP02           | Allied Lab Course-III<br>Botany     |   |           |           |            |            |            |
| 22                  | IV                      | SBEC-I               | 20UZO3S01                           | Aquaculture                             | 2         | 2         | 25         | 75         | 100        |
| 23                  |                         | NMEC-I               |                                     | Non Major Elective Course<br>– I        | 2         | 2         | 25         | 75         | 100        |
| <b>Total</b>        |                         |                      |                                     |   | <b>30</b> | <b>19</b> | <b>150</b> | <b>450</b> | <b>600</b> |
| <b>SEMESTER-IV</b>  |                         |                      |                                     |   |           |           |            |            |            |
| 24                  | I                       | Language             | 20UTA4F04                           | Tami I- IV                              | 5         | 3         | 25         | 75         | 100        |
| 25                  | II                      | Language             | 20UEN4F04                           | English -IV                             | 5         | 3         | 25         | 75         | 100        |
| 26                  | III                     | Core-IV              | 20UZO4C04                           | Cell Biology                            | 5         | 5         | 25         | 75         | 100        |
| 27                  |                         | Allied –IV           | 20UCH4A04                           | Allied Chemistry - IV                   | 5         | 3         | 25         | 75         | 100        |
| 28                  |                         |                      | 20UBO4A04                           | Allied Botany - IV                      |           |           |            |            |            |
| 29                  | IV                      | SBEC-II              | 20UZO4S02                           | Sericulture and Apiculture              | 2         | 2         | 25         | 75         | 100        |
| 30                  |                         | NMEC-II              |                                     | Non Major Elective Course<br>– II       | 2         | 2         | 25         | 75         | 100        |
| 31                  | III                     | Core<br>Practical-II | 20UZO4P02                           | Lab Course-II (Covering<br>core II-III) | 3         | 4         | 40         | 60         | 100        |
| 32                  |                         | 20UCH4AP02           | Allied Lab Course - IV<br>Chemistry | 3                                       | 3         | 40        | 60         | 100        |            |



| <b>Total</b>            |     |                     |            |                                      | <b>30</b>  | <b>26</b>  | <b>230</b>  | <b>570</b>  | <b>800</b>  |
|-------------------------|-----|---------------------|------------|--------------------------------------|------------|------------|-------------|-------------|-------------|
| <b>SEMESTER-V</b>       |     |                     |            |                                      |            |            |             |             |             |
| 34                      | III | Core- V             | 20UZO5C05  | Animal Physiology                    | 5          | 5          | 25          | 75          | 100         |
| 35                      |     | Core- VI            | 20UZO5C06  | Principles of Genetics               | 5          | 5          | 25          | 75          | 100         |
| 36                      |     | Core- VII           | 20UZO5C07  | Biochemistry                         | 5          | 4          | 25          | 75          | 100         |
| 37                      |     | Elective –I         |            | Group-A                              | 5          | 5          | 25          | 75          | 100         |
| 38                      | IV  | SBEC-III            | 20UZO5S03  | Biotechnology                        | 2          | 2          | 25          | 75          | 100         |
| 39                      |     | SBEC-IV             | 20UZO5S04  | Vermitechnology                      | 2          | 2          | 25          | 75          | 100         |
| 40                      | III | Core Practical-III  | 20UZO6P03  | Lab Course-III (Covering Core V-VII) | 3          | -          | -           | -           | -           |
| 41                      |     | Core Practical-IV   | 20UZO6P04  | Lab Course-IV (Covering Core VIII-X) | 3          | -          | -           | -           | -           |
| <b>Total</b>            |     |                     |            |                                      | <b>30</b>  | <b>23</b>  | <b>150</b>  | <b>450</b>  | <b>600</b>  |
| <b>SEMESTER-VI</b>      |     |                     |            |                                      |            |            |             |             |             |
| 42                      | III | Core-VIII           | 20UZO6C08  | Ecology and Ethology                 | 5          | 5          | 25          | 75          | 100         |
| 43                      |     | Core-IX             | 20UZO6C09  | Evolution                            | 5          | 5          | 25          | 75          | 100         |
| 44                      |     | Core-X              | 20UZO6C10  | Developmental Biology                | 5          | 5          | 25          | 75          | 100         |
| 45                      |     | Elective-II         | 20UZO6E03  | Group-B                              | 5          | 3          | 25          | 75          | 100         |
| 46                      | IV  | SBEC-V              | 20UZO6S05  | Public Health and Hygiene            | 2          | 2          | 25          | 75          | 100         |
| 47                      |     | SBEC-VI             | 20UZO6S06  | Poultry Science                      | 2          | 2          | 25          | 75          | 100         |
| 48                      | III | Core- Practical-III | 20UZO6P03  | Lab Course-III (Covering Core V-VII) | 3          | 4          | 40          | 60          | 100         |
| 49                      |     | Core- Practical-IV  | 20UZO6P04  | Lab Course-IV (Covering Core VIII-X) | 3          | 4          | 40          | 60          | 100         |
|                         |     |                     |            | Extension activities                 | -          | 1          | -           | -           | 100         |
| <b>Total</b>            |     |                     |            |                                      | <b>30</b>  | <b>31</b>  | <b>230</b>  | <b>570</b>  | <b>900</b>  |
| <b>CUMULATIVE TOTAL</b> |     |                     |            |                                      | <b>180</b> | <b>140</b> | <b>1090</b> | <b>2910</b> | <b>4100</b> |
| 33                      |     | Allied Practical-II | 20UBO4AP02 | Allied Lab Course-IV Botany          | 3          |            |             |             |             |

**Note**

- CBCS – Choice Based Credit system  
 CIA – Continuous Internal Assessment  
 ESE – End of Semester Examinations



SWAYAM – Study Webs of Active-Learning for Young Aspiring Minds

NPTEL – National Programme on Technology Enhanced

### **Major Elective Courses**

| Semester         | Course Code | Paper Title                             | Credits |
|------------------|-------------|---|---------|
| <b>Group – A</b> |             |   |         |
| Semester -V      | 20UZO5E01   | Medical Laboratory Techniques           | 3       |
|                  | 20UZO5E02   | Biostatistics and computational Biology | 3       |
| <b>Group – B</b> |             |   |         |
| Semester –VI     | 20UZO6E03   | Immunology and Microbiology             | 3       |

### **Non-Major Elective Courses**

| Semester     | Course Code | Paper Title     | Credits |
|--------------|-------------|-----------------|---------|
| Semester III | 20UZO3N01   | Poultry Science | 2       |
| Semester IV  | 20UZO4N02   | Sericulture     | 2       |



# PROGRAMME SYLLABUS



| Program: B.Sc. Zoology |                 |                        |              |                                |
|------------------------|-----------------|------------------------|--------------|--------------------------------|
| Core – I               |                 | Course Code: 20UZO1C01 |              | Course Title: Invertebrate – I |
| Semester<br>I          | Hours/Week<br>5 | Total Hours<br>75      | Credits<br>5 | Total Marks<br>100             |

### Course Objectives

1. To obtain the knowledge of the taxonomical and characteristics of Invertebrates.
2. To understand the morphological and anatomical features of selected Invertebrate.
3. To create awareness about the harmful parasites and their economic importance.

### UNIT-I

**Taxonomy:** Classification - Significance of Classification - Brief history of Classification. Nomenclature of organisms.

**Protozoa:** General Characters and Classification.

Type study: *Paramecium caudatum*– Structure - Reproduction and Development.

**General Topic:** Pathogenic protozoa of Humans – *Plasmodium vivax*, *Leishmania donovani*.

### UNIT-II

**Porifera:** General Characters and Classification.

Type study: *Leucosolenia* – External Morphology – Physiology and Development.

**General Topic:** Canal system in sponges.

### UNIT-III

**Coelenterata:** General Characters and Classification.

Type study: *Obelia* – External Morphology – Reproduction – Life cycle.

**General Topic:** Polymorphism of *Halimastemma*.

### UNIT-IV

**Platyhelminthes:** General Characters and Classification.

Type study: *Taenia solium* – External Morphology – Digestive system and Lifecycle.

**General Topic:** Human Helminthes Parasite



**UNIT– V**

**Aschelminthes:** General characters and classification.

Type of study: *Ascaris lumbricoides* – External Morphology – Digestive System –Reproduction and Development.

**General Topic:** Diseases caused, Symptoms and Control measures of parasitic Worms

*Wuchereria bancrofti, Dracunculus medinensis.*

**Text Books**

1. Ekambaranatha Ayyar M, Anantha krishnan T N, and Viswanathan S (1981). Manual of Zoology, Vol. 1 & 2, Printers & Publishers Pvt. Ltd., Chennai.
2. Jordan E .L and Verma P. S (2000). Invertebrate Zoology, S. Chand &Co.
3. Kotpal R. L (2015). Modern Text Book of Zoology, Invertebrate, Rastogi Publication, Meerut.
4. Nair N. C, Leelavathi S, Soundrapandian N, Murugan T and Arumugam. N (2013). A Text Book of Invertebrates. Saras Publication.

**Reference Books**

1. Agarwal V .K (2000). Invertebrate Zoology, S. Chand Company.
2. Ekambaranatha Ayyar M and Viswanathan S (1954). A Manual of Zoology, Part I. Invertebrata. No.11, McNichols Road Chetput, Madras-31.
3. Kashyap V (1997). Life of Invertebrates. Vikas Publishing House Pvt. Ltd., New Delhi.
4. Kotpal R L (2003). Modern Text Book of Zoology, Rastogi Publications, Meerut. New Delhi.
5. Moore R C, Lalicker C. G, and Fischer A G (1952). Invertebrate Palaeontology, McGraw Hill Book Co.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | Define the evolution any history of phylum.                              | K1              |
| CO2       | Understand about the Invertebrates animals.                              | K2              |
| CO3       | Understand the external as well as internal characters of Invertebrates. | K3              |
| CO4       | Investigate the economic importance of Invertebrates animals.            | K6              |

**K1–Remember, K2–Understand, K3–Apply, K4–Analyze, K5–Evaluate, K6–Create**

### Mapping of COs with POs

| PO \ CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---------|-----|-----|-----|-----|-----|
| CO1     | S   | S   | S   | M   | M   |
| CO2     | S   | S   | M   | M   | M   |
| CO3     | S   | M   | S   | S   | S   |
| CO4     | S   | S   | M   | M   | S   |

**S – Strong**

**M – Medium**

**L – Low**



| Program: B.Sc. Zoology |                 |                        |              |                                |
|------------------------|-----------------|------------------------|--------------|--------------------------------|
| Core – II              |                 | Course Code: 20UZO2C02 |              | Course Title: Invertebrate –II |
| Semester<br>II         | Hours/Week<br>5 | Total Hours<br>75      | Credits<br>5 | Total Marks<br>100             |

### Course Objectives

1. To obtain the knowledge of the taxonomical and characteristics of Invertebrates.
2. To understand the morphological and anatomical features of selected Invertebrates.
3. To create awareness about the harmful parasites and their economic importance of Invertebrates.

#### UNIT-I

**Annelida:** General Characters and Classification.

Type study: *Lampito mauritii* – External Morphology - Digestive system - Reproduction and Development.

**General Topic:** Excretion in Annelids.

#### UNIT-II

**Arthropoda-I:** General Characteristics and Classification up to Classes.

Type study: *Panaeus indicus* – External Morphology and Reproduction.

**General topic:** Economic importance of Insects.

#### UNIT-III

**Arthropoda-II:**

Type study: Cockroach – External Morphology and Reproduction.

**General Topic:** Mouth Parts of Insects.

#### UNIT-IV

**Mollusca:** General Characters and Classification up to Classes.

Type study: *Pila globosa*– Morphology - Respiratory System – Locomotion - Excretory System and Reproduction.



**General Topic:** Economic importance of Molluscs.

### UNIT-V

**Echinodermata:** General Characters and Classification up to Classes.

Type study: *Asterius rubens* (Star fish) – External Morphology and Water vascular System.

**General Topic:** Larval forms of Echinoderms.

### Text Books

1. Jordan E L and Verma P S (2000). Invertebrate Zoology, S. Chand &Co.
2. Kotpal R L (2015). Modern Text Book of Zoology, Invertebrate, Rastogi Publication, Meerut.
3. Nair N C, Leelavathi S, Soundrapandian N, Murugan T and Arumugam N (2013). A Text Book of Invertebrates. Saras Publication.

### Reference Books

1. Agarwal V K (2000). Invertebrate Zoology, S. Chand Company.
2. Ekambaranatha Ayyar M (1973). A Manual of Zoology, Part I. Invertebrata. S. Viswanathan Pvt. Ltd,
3. Kashyap V (1997). Life of Invertebrates. Vikas Publishing House Pvt. Ltd., New Delhi.
4. Kotpal RL (2003). Modern Text Book of Zoology. Rastogi Publications, Meerut.
5. Moore R C, Lalicker and Fischer A G (1952). Invertebrate Palaeontology, McGraw Hill Book Co. Inc., New York.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | Define the internal and external morphology of the animal.           | K1              |
| CO2       | Understand the concepts of Metamorphosis, regeneration and autonomy. | K2              |
| CO3       | Demonstrate the Mouthparts of insects.                               | K3              |
| CO4       | Distinguish the economic importance of Molluscs.                     | K4              |
| CO5       | Investigate the Water vascular System in <i>Asterius rubens</i>      | K6              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**  
Mapping of COs with POs

| PO \ CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---------|-----|-----|-----|-----|-----|
| CO1     | S   | S   | S   | M   | M   |
| CO2     | S   | M   | M   | S   | M   |
| CO3     | S   | M   | S   | S   | S   |
| CO4     | M   | S   | M   | S   | S   |
| CO5     | M   | M   | S   | M   | M   |

**S – Strong**

**M–Medium**

**L –Low**



| Program: B.Sc. Zoology |                 |                        |              |                                   |
|------------------------|-----------------|------------------------|--------------|-----------------------------------|
| Core Practical – I     |                 | Course Code: 20UZO2P01 |              | Course Title: Invertebrate I & II |
| Semester<br>I & II     | Hours/Week<br>3 | Total Hours<br>45      | Credits<br>4 | Total Marks<br>100                |

### Course Objectives

1. To observe various Invertebrate specimens by using Microscope.
2. To know the various systems (Digestive system, Nervous system and Reproductive system) of animals.
3. To inculcate the significance of various Invertebrate animals.

### **I. Major Practicals**

Cockroach digestive system - Nervous system - Reproductive system and Prawn Nervous system

### **II. Minor Practicals**

Prawn Appendages - Mouth parts – Honey bee - Mosquito and Cockroach.

### **III. Spotters**

#### **Classify and giving reasons:**

Paramecium – Sycon - Obelia colony - *Taenia solium* - Earth worm – Leech - Sea cucumber - Star fish - freshwater mussel – Prawn and Neries

#### **Draw labelled sketches:**

T.S. of *Ascaris* (Male and Female) - T.S. of *Hydra* - T.S. of *Taenia solium* proglottid and T.S. of *Fasciola*.

**Biological significance:** Gemmule - Spicules – *Limulus* – Leech - *Bipinnaria* larva and *Physalia*.

#### **Relate structure and function:**

*Taenia scolex* - Earthworm body setae - Star fish – Tube feet - *Peneus* – *Petasma* and *Nereis* – Parapodium.

#### **Submission of Practical Record**



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | Identified invertebrates specimen slides under compound microscope.                  | K2              |
| CO2       | Examine the various anatomical system of invertebrates animal.                       | K4              |
| CO3       | Evaluate the biological significance and structure and functions of various animals. | K5              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO \ CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---------|-----|-----|-----|-----|-----|
| CO1     | S   | S   | M   | M   | M   |
| CO2     | S   | M   | S   | S   | M   |
| CO3     | S   | M   | M   | S   | S   |

**S – Strong**

**M–Medium**

**L –Low**



| Program: B.Sc. Zoology |                 |                        |              |                        |
|------------------------|-----------------|------------------------|--------------|------------------------|
| Core – III             |                 | Course Code: 20UZO3C03 |              | Course Title: Chordata |
| Semester<br>III        | Hours/Week<br>5 | Total Hours<br>75      | Credits<br>5 | Total Marks<br>100     |

### Course Objectives

1. To obtain comprehensive knowledge on the taxonomy and Characteristics of Chordates.
2. To understand the morphological and anatomical features of Chordates.
3. To study the general features distribution and economic importance of Chordates.
4. To study the flight adaptation and migration of birds.
5. To study Prototheria, Metatheria and dentition in mammals.
6. To study the detailed information about Amphioxus, Scoliodon, Frog, Pigeon and Rat.

#### UNIT-I

Outline classification of Chordates.

**Prochordata:** Classification and Characteristics up to Classes with suitable examples.

Type study: *Branchiostoma lanceolatum* (Amphioxus) – Digestive system -Respiratory system and Urinogenital system.

**Pisces:** Classification and Characteristics (Chondrichthyes, Osteichthyes)

Type study: *Scoliodon sorrakowah* – Digestive system – Respiratory system – Circulatory system and Urinogenital system.

**General Topic:** Migration of Fishes

#### UNIT-II

**Amphibians:** Classification and General Characteristics of Amphibians.

Type study: *Rana hexadactyla* – External Morphology – Digestive system – Respiratory system – Circulatory system and Urinogenital system.

**General Topic:** Parental care in Amphibians.



**UNIT-III**

**Reptilia:** Classification and General Characteristics.

Type study: *Calotes versicolor* – External Morphology – Digestive system – Respiratory system – Circulatory system and Urinogenital system.

**General Topic:** Identification of poisonous and Non-poisonous Snakes.

**UNIT-IV**

**Aves:** Classification and characteristics.

Type study: *Columba livia* – External Morphology – Digestive system – Respiratory system – Circulatory system and Urinogenital system.

**General Topics:** Migration in Birds and Flight adaptation.

**UNIT-V**

**Mammals:** Classification and General Characteristics of Mammals.

Type study: *Oryctolagus cuniculus* – External Morphology – Digestive system – Respiratory system – Circulatory system and Urinogenital system

**General Topic:** Dentition in Mammals (Rabbit & Human).

**Text Books**

1. Ekambaranatha Ayyar M, Ananthakrishnan T N and Viswanathan S (1981). Manual of Zoology Vol.1 & 2 Printers & Publishers Pvt.Ltd.,
2. Jordan E L and Verma P S (1965). Chordate Zoology & Elements of Physiology, Meerut.
3. Jordan E L and Verma P S (2013). Chordate Zoology S Chand & Company Ltd., NewDelhi.
4. Kotpal R L (2012). Morden Text Book of Zoology, Vertebrates Rastogi Publication, Meerut.
5. Nigam H C (1972). Zoology of Chordates. (5<sup>th</sup>Edn.), S. Nagin& Co. Publishers, Delhi.
6. Thangamani A, Prasannakumar S, Narayanan L M and Arumugam N (2009). Chordates, Saras Publication.
7. Young J Z (1981). The Life of the Vertebrates. (3<sup>rd</sup>Edn.), Oxford University Press, Great Britain.



### Reference Books

1. Dhama P S and Dhama J K (1982). Chordate Zoology, R.Chand & Co. Publishers, New Delhi.
2. Ekambaranatha Ayyar M, Ananthkrishnan T N and Viswanathan S (1981). Manual of Zoology Vol.1 & 2 Printers & Publishers Pvt. Ltd., Chennai.
3. Jordan E L and P S Verma (2013). Chordate Zoology, S Chand & Company Ltd., New Delhi.
4. Jordan E L and Verma P S (1965). Chordate Zoology & Elements of Physiology, Meerut.
5. Kotpal R L (1996). Modern Text Book of Zoology Vertebrates. Rastogi Publications, New Delhi.
6. Kotpal R L (2012) Modern Text Book of Zoology, Vertebrates Rastogi Publication. Meerut.
7. Nigam H C (1972). Zoology of Chordates (5<sup>th</sup> Edn.), S. Nagin & Co. Publishers, Delhi.
8. Thangamani A, Prasannakumar S, Narayanan L M and Arumugam N (2009). Chordates, Saras Publication.
9. Waterman A J (1971). Chordate Structure and Function. Macmillan Company, New Delhi.
10. Young J Z (1981). The Life of the Vertebrates. (3<sup>rd</sup> Edn.), Oxford University Press, Great Britain.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| CO1       | List out the taxonomy and characteristics of chordates.               | K1              |
| CO2       | Understand the morphological and anatomical features of chordates.    | K2              |
| CO3       | Distinguish the Economic importance of chordates.                     | K4              |
| CO4       | Investigate the various systems, adaptation and dentition in Mammals. | K5              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

| <b>PO<br/>CO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> |
|------------------|------------|------------|------------|------------|------------|
| <b>C01</b>       | S          | M          | M          | S          | S          |
| <b>C02</b>       | S          | S          | S          | M          | M          |
| <b>C03</b>       | S          | M          | S          | S          | M          |
| <b>C04</b>       | S          | S          | M          | M          | S          |

**S – Strong**

**M–Medium**

**L –Low**



| Program: B.Sc. Zoology |                 |                        |              |                           |
|------------------------|-----------------|------------------------|--------------|---------------------------|
| SBEC – I               |                 | Course Code: 20UZO3S01 |              | Course Title: Aquaculture |
| Semester<br>III        | Hours/Week<br>2 | Total Hours<br>30      | Credits<br>2 | Total Marks<br>100        |

### Course Objectives

1. To study the water quality management.
2. To study the culture Techniques of important freshwater fishes.
3. To study the culture techniques of Ornamental fish culture.
4. To the disease management during aquaculture.

#### **UNIT-I**

Scope of Aquaculture in India – Types of aquaculture – Extensive – Intensive and Semi Intensive – Culture – Monoculture - Poly culture – Integrated farming – Pond culture - Pen and Cage culture.

#### **UNIT-II**

Cultivable species – Indian Major carp (Catla, Rohu and Mirgal), Crustaceans and Molluscs. Pond preparation – Basic fish farm design – Selection of site – Water and soil and Types of Pond.

#### **UNIT-III**

Fresh water Prawn culture (*Macrobrachium rosenbergii*) and Marine Prawn culture (*Penaeus monodon*). Ornamental fish culture (Black molly and Guppy) and Construction of home aquarium.

#### **UNIT-IV**

Water quality maintenance – Seed selection and health analysis – Molecular techniques in aquaculture – Importance and composition of feeds – Types of feed – Molecular techniques in aquaculture – Importance and composition of feeds Formulation of artificial diets. Live feeds – Probiotics in aquaculture.

#### **UNIT-V**

Harvesting - Methods of fishing – Transportation and Marketing of fish – Methods of



preservation – Curing – Drying – Mono curing - Smoking - Icing - Freezing and Canning.

### Text Books

1. Ayyappan S J, Jena J, Gopalakrishnan A and Pandey A .K (2011). Handbook of fisheries and aquaculture. Indian Council of Agricultural Research. Directorate of Information and Publications on Agriculture, Directorate of Information and Publications of Agriculture, Indian Council of Agricultural Research, New Delhi, India.
2. Santhanam R (1990). Fisheries Science, Daya publishing House, NewDelhi.
3. Srivasta C B L (2002). A text book of fishery science and Indian fisheries, KitabMahal, Allahabad.

### Reference Books

1. Annan J F, Smiteman R O and Tehebenoglous G (1983). Principles and practices of Pond Aquaculture Oregon State University, U.S.A.
2. Aquaculture. FAO Fisheries Tech. Paper 361, FAO.
3. James P M (1983). Handbook of Mariculture. Vol. I. Crustacean Aquaculture. CRC Press.
4. Jhingran V G (1982). Fish and Fisheries in India, Hindustan Publishing Corporation, New Delhi.
5. Lavens P & Sorgeloos P (1996). Manual on the Production and Use of Live Food for
6. Shankar K M & Mohan C V (2002). Fish and Shellfish Health Management. UNESCO, Publisher.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| CO1       | Define fish health management for successful production of fishes.                    | K1              |
| CO2       | Understand the breeding and culture techniques.                                       | K2              |
| CO3       | Design the fish farm and construction of aquarium                                     | K6              |
| CO4       | Formulate the feed and nutrition management for betterment of ornamental fish culture | K6              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

| <b>CO \ PO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> |
|----------------|------------|------------|------------|------------|------------|
| <b>CO1</b>     | S          | S          | M          | S          | M          |
| <b>CO2</b>     | S          | S          | M          | M          | M          |
| <b>CO3</b>     | S          | S          | S          | M          | M          |
| <b>CO4</b>     | S          | S          | M          | M          | S          |

**S – Strong**

**M–Medium**

**L –Low**



| Program: B.Sc. Zoology |                 |                              |              |                                  |
|------------------------|-----------------|------------------------------|--------------|----------------------------------|
| NMEC – I               |                 | Course Code:<br>20UZO3NMEC01 |              | Course Title: Poultry<br>Science |
| Semester<br>III        | Hours/Week<br>2 | Total Hours<br>30            | Credits<br>2 | Total Marks<br>100               |

### Course Objectives

1. To impart training on Modern Poultry Farming Technology
2. To create knowledge on Self –Employment opportunity.

#### **UNIT –I**

Introduction to poultry keeping – Poultry Industry in India – Important breeds of Poultry – Desi, – Chittagong and Leghorn

#### **UNIT -II**

Construction of Poultry House – Deep litter system – Cage system – Broiler house.

#### **UNIT -III**

Poultry Feeds – Essential Nutrients – Ration for Chick and Broiler.

#### **UNIT -IV**

Management of Broilers – Nutritive value of egg and meet – Incubation and Hatching of Eggs.

#### **UNIT –V**

Common diseases of poultry – Raniket- Fowl Pox -Coccidiosis and Coryza, Vaccination programme.

#### **Text Books**

1. Keith Wilson (2007). A Hand Book of Poultry Practice. (2<sup>nd</sup>Edn), Agrobios (India), Jodhpur.
2. Norris Elye (2005). The Poultry Science L.C.R. Biotech books. Delhi.

#### **Reference Books**

1. Gnanamani M R (1978). Poultry Keeping, Deepana Publications.
2. Shukla G S and Upadhay V B (2004). Economic Zoology, Rastogi Publication.
3. Sing R A (1996). Poultry production. Kalyan publishers.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| CO1       | List out the formulate diets for poultry.   | K1              |
| CO2       | Understand the specific areas of poultry production including breeding, nutrition, health, welfare and product quality. | K2              |
| CO3       | Evaluate the quality of poultry meat and eggs.  | K5              |
| CO4       | Investigate the diseases in poultry industry.   | K6              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO \ CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---------|-----|-----|-----|-----|-----|
| CO1     | S   | S   | S   | M   | M   |
| CO2     | S   | S   | M   | M   | M   |
| CO3     | S   | M   | S   | M   | S   |
| CO4     | S   | S   | M   | M   | S   |

**S – Strong**

**M–Medium**

**L –Low**





| Program: B.Sc. Zoology |                 |                        |              |                            |
|------------------------|-----------------|------------------------|--------------|----------------------------|
| Core – IV              |                 | Course Code: 20UZO4C04 |              | Course Title: Cell Biology |
| Semester<br>IV         | Hours/Week<br>5 | Total Hours<br>75      | Credits<br>5 | Total Marks<br>100         |

### Course Objectives

1. To provide the fundamental knowledge on cell types and characters.
2. To enhance the knowledge on cell organelles and their role in metabolic activities.
3. To understand the cell division and genetic makeup of the cell and its significance.

#### **UNIT-I**

**Microscopy:** Compound and Electron Microscopes – Microtomy- Stains – Nuclear and Cytoplasmic stains and Staining Techniques- Structure of Prokaryotes and Eukaryotes cells.

#### **UNIT-II**

Structure and function of Plasma membrane – Lysosomes and its Polymorphism – Golgi bodies and Ribosomes.

#### **UNIT-III**

Structure – Functions and Origin of Endoplasmic reticulum – Mitochondria – Nucleus and Nucleolus – Structure and Chemical composition of Peroxisomes and glyoxysomes.

#### **UNIT-IV**

**Giant Chromosome:** Polytene and Lampbrush Chromosomes – Structure and functions of Centrosomes. Cell cycle – Mitosis and Meiosis and Significance of Meiosis.

#### **UNIT-V**

**Nucleic acids:** Structure of DNA and RNA - DNA replication – Transcription – RNA types - Genetic code and Protein synthesis.

**Cancer biology:** Study of cancer cells – Oncogenes and Chemotherapy.

#### **Text Books**

1. Ambrose E J and Easty D M – Cell Biology (ELBS).
2. Arumugam N (2007). Cell Biology (6<sup>th</sup>Edn.,) Saras Publications, Kanyakumari.
3. Loewy A G and Seikovitz P (1969). Cell structure and function (Half Rinchart



and Winstion)

- Swanson C F and Waster P L (1978). The cell (4<sup>th</sup>Edn), Prentice Hall of India.
- Verma P S and Agarval V K (1999). Text Book of Cytology, S. Chand & Company (Pvt.) Ltd., New Delhi.

### Reference Books

- Ambrose E J and Dorothy M Easty (1970). Cell Biology, (2<sup>nd</sup>Edn), The English Language Book Society & Nelson, Great Britain at the Camelot Press Ltd., Southampton.
- Dorothy M, Ambrose E J, Easty (1970). Cell Biology, (2<sup>nd</sup>Edn.), The English Language Book Society & Nelson, Great Britain at the Camelot Press Ltd.,
- Gerald Karp and Nancy L Pruitt (1998). Cell and Molecular Biology: Concepts and Experiments. Publisher John Wiley & Sons.
- Power C B (2009). Cell Biology, Himalaya Publishing House, Mumbai.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| CO1       | Define the principles and techniques of molecular biology.            | K1              |
| CO2       | Understand the cell organelles and their role in metabolic activities | K2              |
| CO3       | Analyze the chromosomal arrangements during cell Division             | K4              |
| CO4       | Investigate the Cell aging, oncogenes and chemotherapy.               | K6              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO \ CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---------|-----|-----|-----|-----|-----|
| CO1     | S   | S   | S   | M   | M   |
| CO2     | S   | M   | S   | S   | S   |
| CO3     | M   | S   | M   | S   | S   |
| CO4     | S   | S   | M   | M   | S   |

**S – Strong**

**M–Medium**

**L –Low**



| Program: B.Sc. Zoology |                 |                        |              |  |
|------------------------|-----------------|------------------------|--------------|--|
| SBEC – II              |                 | Course Code: 20UZO4S02 |              | Course Title: Sericulture & Apiculture |
| Semester<br>IV         | Hours/Week<br>2 | Total Hours<br>30      | Credits<br>2 | Total Marks<br>100                     |

### Course Objectives

1. To create a self-employment opportunity among student.
2. To equip the skills of rearing of silkworms.
3. To create better breeding and grainage techniques.

#### **UNIT-I**

History and scope of Sericulture – Types of Silkworm- Tasar, Muga and Eri – Morphology and Life cycle of *Bombyx mori* – Races of mulberry silkworm – Diseases of Silkworm – Pebrine – Flachere - Grasserie.

#### **UNIT-II**

**Mulberry Cultivation:** Mulberry Varieties – Preparation of land – Propagation of mulberry plants – Irrigation and Pruning – Harvesting and Storage of mulberry leaves and Pests of mulberry plants

**Rearing of Techniques:** Rearing room – Cleaning – Incubation of eggs – Rearing of worms. Rearing appliances – Feeding – Spacing – Mounting and Harvesting of Cocoon.

#### **UNIT-III**

**Silk Reeling:** Silk Reeling and Appliances – Silk properties – Organic Silk - Dyeing of silk.

#### **UNIT-V**

**Apiculture:** Scope of Apiculture – .Types of Honey Bees (*Apis dorsata*, *Apis floreae*, *Apis indica* and *Dammer bee* ) – Life Cycle (*Apis indica*) – Bee Keeping and Equipment – Social Behaviors of Honey Bee

#### **UNIT-V**

Newton'shive Extraction of Honey – Chemical composition of Honey – Nutritional value and medicinal value – Bee wax and Bee venom – Bee enemies and Diseases – Nosima – Acarine – Septecaemia.

**Text Books**

1. Dandan S B (2004). Hand book of new sericulture technologies, Central Silk Board Bangalore.
2. Ganga G and Sulochana Chetty J (2010). An Introduction to Sericulture, (2<sup>nd</sup>Edn), Oxford and IBH Publishing House Co. Pvt. Ltd., New Delhi.
3. Jayashree K V, Thara Devi C S and Arumugam N (2015). Apiculture, Saras Publication, Kanyakumari, TamilNadu.
4. Kumar A and Nigam P M (2008). Economic and Applied Entomology, Emkay Publications.
5. Madan Mohan Rao M (1998). A Text Book of Sericulture, B.S. Publications, Hyderabad.
6. Pradip V Jabde (1993). Text book of Applied Zoology, Discovery publishing house, New Delhi.
7. Shukla G S and V B Upadhyay (2008). Economic Zoology, (4<sup>th</sup>Edn). Rastogi Publication, Meerut.
8. Upadhyay V B and Shukla G S (2014). Applied and Economic Zoology, (5<sup>th</sup>Edn), Rastogi Publications, Meerut.
9. Venkatanarasaiah P (2002). Sericulture, Daya Publishing House, New Delhi.

**Reference Books**

1. Fenemore P G and Prakash A (2002). Applied Entomology, New age international (P) publishers, New Delhi.
2. Fred V Theobald (1989). Economic Zoology, Print well Publisher. Jaipur. India.
3. Manju Yadav (2003) Economic Zoology, Discovery Publishing House, New Delhi.
4. Nayar K K, Anathkrishnan T N and David B V (1983). General and Applied Entomology, Tata McGraw Hill publishing Co. Ltd., New Delhi.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | Explain the mulberry and non-mulberry silkworms.           | K1              |
| CO2       | Understand the various silkworm rearing techniques.        | K2              |
| CO3       | Analyze the control measures of silkworm diseases.         | K4              |
| CO4       | Investigate the silkworm breeding and grainage techniques. | K6              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO \ CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---------|-----|-----|-----|-----|-----|
| CO1     | S   | S   | M   | M   | M   |
| CO2     | S   | S   | M   | M   | S   |
| CO3     | S   | M   | S   | M   | S   |
| CO4     | S   | S   | M   | S   | M   |

**S – Strong**

**M–Medium**

**L –Low**



| Program: B.Sc. Zoology |                           |                   |                           |                 |
|------------------------|---------------------------|-------------------|---------------------------|-----------------|
| NMEC – II              | Course Code: 20UZO4NMEC02 |                   | Course Title: Sericulture |                 |
| Semester IV            | Hours/Week<br>2           | Total Hours<br>30 | Credits<br>2              | Hours/Week<br>2 |

### Course Objectives

1. To create a self-employment opportunity among student.
2. To equip the skills of rearing of silkworms.
3. To create better breeding and grainage techniques.

#### **UNIT-I**

Types of silk worms – Mulberry – Tasar – Muga and Eri. Morphology and life cycle of mulberry silk worm.

#### **UNIT-II**

Mulberry cultivation in India - Selection of land – Mulberry varieties – Methods of planting – Organic and inorganic manure application

#### **UNIT-III**

Disinfection of rearing houses and appliances - Egg transportation and incubation – Egg handling – Hatching – Brushing – Silk worm rearing techniques.

#### **UNIT-IV**

Pest and diseases of silk worm and preventive measures. Harvesting of cocoon and cocoon assessment.

#### **UNIT-V**

Reeling methods - Re-reeling – Silk examination – Cleaning – Lacing – Skeining - Book making – Grading of silk.

#### **Text Books**

1. Madan Mohan Rao M (2008) A text book of sericulture B.S Publications, Hyderabad.
2. Ganga & Sulochanachetty G (2006) An introduction to sericulture. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.

#### **Reference Books**

1. Ullal .S.R and M.N Narasimhanna( 1977) Hand book of Practical Sericulture Published by Shri .A.R S. Gopalachar Secretary ,Central silk board ,.Meghdoot, Bombay.



2. Rangaswami.G and S. Manjeet. Jolly. (1988) Sericulture Manual –I , Mulberry Cultivation  
Published by Mohan Pramlani for Oxford & IBH publishing CO. Pvt.Ltd. New Delhi

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | Explain the mulberry and non-mulberry silkworms.           | K1              |
| CO2       | Understand the various silkworm rearing techniques.        | K2              |
| CO3       | Analyze the control measures of silkworm diseases.         | K4              |
| CO4       | Investigate the silkworm breeding and grainage techniques. | K6              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO \ CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|---------|-----|-----|-----|-----|-----|
| CO1     | S   | S   | M   | M   | M   |
| CO2     | S   | S   | M   | M   | S   |
| CO3     | S   | M   | S   | M   | S   |
| CO4     | S   | S   | M   | S   | M   |

**S – Strong**

**M–Medium**

**L –Low**



| Program: B.Sc. Zoology       |                               |                          |  |                        |
|------------------------------|-------------------------------|--------------------------|--|------------------------|
| <b>Core Practical – II</b>   | <b>Course Code:</b> 20UZO4P02 |                          | <b>Course Title:</b> Chordata and Cell Biology |                        |
| <b>Semester III &amp; IV</b> | <b>Hours/Week</b><br>3        | <b>Total Hours</b><br>45 | <b>Semester III &amp; IV</b>                   | <b>Hours/Week</b><br>3 |

### Course Objectives

1. To obtain the knowledge of morphology and anatomy of the chordates animals.
2. To impart the practical knowledge on Haematological studies.
3. To understand mitotic and meiotic cell divisions.

### **I. Major Practicals**

1. Total Count of RBC using Haemocytometer.
2. Total Counting of WBC using Haemocytometer.
3. Study of mitotic division using onion root tips.

### **II. Minor Practicals**

1. Blood Smear preparation in man.
2. Preparation of Human Buccal smear.
3. Human blood groups.

### **III. Spotters**

**Classify and giving reasons:** Shark, Amphioxus, Hyla, *Naja Naja*, Pigeon and Rabbit.

**Draw labelled sketches:** Frog - Pelvic, Pectoral girdle, Hyoid apparatus and Draco.

**Biological significance:** Chameleon, Bat, Ichthyophis, Petromyzon and Echinosis.

**Relate structure and function:** Skull of Rabbit and Dog.

### **Submission of Practical Record**





### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| CO1       | To state that cell and its functions.                     | K1              |
| CO2       | Describe the morphology and anatomy on chordates          | K2              |
| CO3       | To examine the mitotic and meiotic cell divisions.        | K4              |
| CO4       | Investigate the bioinstrumentation in medical laboratory. | K6              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | M   | S   | S   | S   | M   |
| CO2      | S   | S   | M   | M   | M   |
| CO3      | S   | S   | S   | S   | S   |
| CO4      | S   | S   | M   | S   | S   |

**S – Strong**

**M– Medium**

**L –Low**



| Program: B.Sc. Zoology |                        |                   |                                 |                    |
|------------------------|------------------------|-------------------|---------------------------------|--------------------|
| Core – V               | Course Code: 20UZO5C05 |                   | Course Title: Animal Physiology |                    |
| Semester<br>V          | Hours/Week<br>5        | Total Hours<br>75 | Credits<br>5                    | Total Marks<br>100 |

### Course Objectives

1. To get knowledge about the nutrition and feeding mechanism.
2. To understand the structure and functions of various organ systems in the animal.
3. To distinguish the interrelationship within physiological systems.

### UNIT-I

**Nutrition and Respiration:** Types of nutrition – Feeding mechanisms – Digestion – Extra cellular and intracellular. Metabolism of carbohydrates – Fats and Protein. Vitamins and Minerals.

**Respiration:** Types of Respiration – Transport of gases – O<sub>2</sub> and CO<sub>2</sub> – Bohr's effect - Chloride shift. Anaerobiosis.

**Enzymes:** Mechanism of enzyme action and co-enzymes.

### UNIT-II

#### **Circulation and Excretion:**

**Circulation:** Types of heart – Pacemaker – Neurogenic and Myogenic hearts – Blood and its composition – Mechanism of blood clotting – Lymphatic system and its functions. Origin and conduction of heart beat in man and Blood pressure.

**Excretion:** Ammonotelism – Ureotelism and Uricotelism. Structure of mammalian nephron – Urine formation – Hormonal control of renal function. Osmoregulation in Freshwater (Teleost) – Marine (Teleost) and Terrestrial animals.

### UNIT-III

**Nerve Physiology:** Types of nerves – Myelinated and non-myelinated nerve fibers – Synapse. Origin and Conduction of nerve impulse; Interneuronal transmission – Neuromuscular junction – Neurotransmitters and Reflex action.

### UNIT-IV

**Muscle Physiology:** Structure and properties of muscles – Isotonic – Isometric contractions – Chemistry of muscle contraction – Physiology of muscle contraction – Theories of muscle contraction and Kymograph.

### UNIT – V

**Endocrinology:** Structure and functions of endocrine glands in Human – Pituitary – Thyroid



– Parathyroid – Islets of Langerhans – Adrenals – Testis - Ovary and Pineal gland and Role of hormones in regulation of metabolism.

### **Text Books**

1. Goyal K A and Sastry K V (2012). Animal Physiology. Rastogi Publications, Meerut, India.
2. Parameswaran, Anantakrishnan and Ananta Subramanyam (1975). Outlines of Animal Physiology, S. Viswanathan (printers & Publishers) Pvt.Ltd.
3. Sambasivaiah, KamalakaraRao and Augustine Chellappa (1990). A Text book of Animal physiology and Ecology, S. Chand & co., Ltd., New Delhi – 110055.
4. Verma P S and Agarwal V K (2009). Animal Physiology. S.Chand & Company Ltd., New Delhi.
5. William S Hoar (1976). General and comparative physiology, Prentice Hall of India Pvt. Ltd., New Delhi.

### **Reference Books**

1. Bentley P J (1998). Comparative Vertebrate Endocrinology. Cambridge University Press UK, (S. Chand &Co.).
2. Best C H and Taylor N B (1985). Physiology Basis of Medical Practice. The Wilkins Company, Baltimore.
3. Gorbman A and Bern H A (1983). Text Book of Comparative Endocrinology. Wiley Western Pvt. Ltd.,USA.
4. Hoar W S (1975).General and Comparative Physiology. Prentice - Hall of India, Pvt. Ltd. New Delhi.
5. Prosser C L and Brown FO. (1961). Comparative Animal Physiology (2<sup>nd</sup>Edn.), WB Saunders Co. Philadelphia, Toppa Co. Tokyo, Japan.

**Course Outcome (COs)**

On successful completion of the course, the students will be able to

| <b>CO Number</b> | <b>CO Statement</b>   | <b>Knowledge Level</b> |
|------------------|---|------------------------|
| <b>CO1</b>       | Define the molecular and cellular basis of physiological functions in animals.  | K1                     |
| <b>CO2</b>       | Explain the regulation of organ system functions in a whole animal using a conceptual model of feedback to explain homeostasis. | K2                     |
| <b>CO3</b>       | Demonstrate the structure-function relationships; how form follows function in animals.   | K3                     |
| <b>CO4</b>       | Organize the parts of the body are linked into a functioning.   | K4                     |
| <b>CO5</b>       | Value for principle of homeostasis and the methods used by the body to maintain this.   | K5                     |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

**Mapping of COs with Pos**

| <b>PO<br/>CO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> |
|------------------|------------|------------|------------|------------|------------|
| <b>CO1</b>       | S          | S          | M          | M          | M          |
| <b>CO2</b>       | S          | M          | S          | S          | M          |
| <b>CO3</b>       | M          | S          | S          | S          | S          |
| <b>CO4</b>       | S          | S          | M          | M          | M          |
| <b>CO5</b>       | S          | M          | S          | M          | S          |

**S – Strong**

**M–Medium**

**L –Low**



| Program: B.Sc. Zoology |                        |                                      |           |                 |
|------------------------|------------------------|--------------------------------------|-----------|-----------------|
| Core – VI              | Course Code: 20UZ05C06 | Course Title: Principles of Genetics |           |                 |
| Semester V             | Hours/Week 5           | Total Hours 75                       | Credits 5 | Total Marks 100 |

### Course Objectives

1. To make the students to develop a comprehensive knowledge of pioneers and their contributions to genetics.
2. To make the students understand various principles of heredity.
3. To create the knowledge about the application of genetic principles in different populations.

#### **UNIT-I**

**Mendelian Principles:** Monohybrid and Dihybrid Crosses. Interaction of genes: Complementary gene – Supplementary gene – Epitasis – Lethal gene – Cumulative gene. Incomplete Dominance – Co-dominance and Pleiotropism and Problems.

#### **UNIT-II**

Multiple Alleles with reference to Human Blood groups (A, B, AB, O and Rh factor) and Coat Colour in Rabbit. Linkage and Crossing Over – Chromosomal mapping – Sex determination in Man – Non-Disjunction and Syndrome Diseases in Man. (Klinefelter Syndrome – Down's syndrome and Turner's syndrome).

#### **UNIT-III**

Sex Linked Inheritance in Man – Haemophilia and colour blindness in Man – Sex limited and Sex influenced inheritances – Gene Mutation – Chromosomal aberration and Ploidy – Inborn errors of metabolism – Phenyl ketonuria – Alkaptonuria and Albinism.

#### **UNIT-IV**

Economic Importance and Application of Genetic Principles (Inbreeding and Outbreeding and Hybrid Vigour) in Animal Breeding.

#### **UNIT-V**

Eugenics – Euphenics and genetic counseling – Human Genome Project and Pedigree analysis. Twins – Monozygotic – Dizygotic - Conjoined Identification of DNA as the Genetic material Griffith Experiments – Hershey and Chase experiment.

#### **Text Books**

1. Gupta P K (2008). A Text book of Genetics. Rastogi Publications, Shivaji Road, Meerut.
2. Meyyan R P (2016) Genetics Vol.3 Saras Publication, Nagercoil, TamilNadu.
3. Singh B D (2006). Fundamentals of Genetics. Kalyani Publishers. Lucknow



4. Verma P S and Agarwal V K (2007). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand and Company Ltd. New Delhi.

### Reference Books

1. Gardner E J (1984). Principles of Genetics. Eiley Eastern Ltd. New York.
2. Mange E J and Mange AP(1997). Basic Human Genetics. Rastogi Publications, Meerut.
3. Power C B (2003). Genetics. Himalaya Publication.
4. Rastogi V B (1990). A Text Book of Genetics. Kedar Nath Ram Nath, Meerut.
5. Sharma A K (1980). Genetics. Butter Work & Co Ltd., London.
6. Snustad Simmons and Jenkins (1999). Principal of Genetics, John Wiley & Sons, New York.
7. Verma P S & Agarwal V K (2006). Molecular Biology, Genetics, Molecular Biology, Evolution and Ecology, S. Chand & Company Ltd., Ram Nagar, New Delhi.

### Course Outcome (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| CO1       | Define the basic principles and concepts of genetics.         | K1              |
| CO2       | Describe the importance of mutation, heredity and variations. | K2              |
| CO3       | Interpret of recent advances in genetics.                     | K3              |
| CO4       | Defend genetic disorders and their role in man.               | K5              |

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### Mapping of COs with Pos

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | S   | S   | S   | M   | M   |
| CO2      | M   | S   | M   | M   | S   |
| CO3      | S   | M   | S   | M   | S   |
| CO4      | S   | S   | M   | S   | M   |

S – Strong

M–Medium

L –Low



| Program: B.Sc. Zoology |            |                        |         |                            |
|------------------------|------------|------------------------|---------|----------------------------|
| Core – VII             |            | Course Code: 20UZO5C07 |         | Course Title: Biochemistry |
| Semester               | Hours/Week | Total Hours            | Credits | Total Marks                |
| V                      | 5          | 75                     | 5       | 100                        |

### Course Objectives

1. To define and explain the basic principles of biochemistry.
2. To study the basic structure of nucleic acids.
3. To study the classification, structure and biological importance of Carbohydrates, Protein and Lipid.
4. To study the Classification, Kinetics of enzymes and its role in food industries.

### **UNIT-I**

**Introduction** – Scope of Biochemistry – Atomic structure – Chemical bands – Ionic - Covalent and Hydrogen band – Van der Walls force – Acid basic concept – Oxidation – Reduction reaction – Redox potential of living system – Water and its Functions – Dissolved gases and their properties – pH and Buffer.

### **UNIT-II**

**Carbohydrates and Lipids:** Classification of carbohydrates – Monosaccharide - Disaccharides and Polysaccharides. Basic molecular structure – Peptidoglycans. Lipids – Triglycerides – Fatty acids and glycerol – Steroids and Cholesterol.

### **UNIT-III**

**Proteins:** Basic structure and classification. Classification of amino acids with examples – Simple – Acidic – Basic – Hydroxylic – Sulphated and Aromatic amino acids. Nucleic acids – Basic molecular structure of DNA, RNA and their types.

### **UNIT-IV**

**Enzymes:** Classification of enzymes and mode of Action – Enzyme Kinetics. Enzymes in the production of new compounds – Enzymes in food industry and food processing – Enzymes as research tools ELISA method.

### **UNIT-V**

**Hormones:** Classification and types – General structure of Hormone – Organ specific hormones – Mechanism of hormonal action and regulation – Receptors of hormones and G- protein.

### **Text Books**

1. Dulsy Fatima and Meyyan R P (2004). Biochemistry, Saras Publication. Kanniyakumari
2. Talwar G P & Srivastava LM(2003). Text Book of Bio Chemistry and Human Biology



3. Eastern Economy Edition, Prentice Hall of India. NewDelhi.
4. Verma P S (2004). Biochemistry, Chand & Co.

### Reference Books

1. Harper H P (1981). Harper's Review of Biochemistry, Lange Medical Publication.
2. John W Baynes (2005). Med H. Dominick, Medical Biochemistry.
3. Lehninger A L (2008). Principles of Biochemistry, W.H. Freeman Publisher.
4. Lehninger 1992 Biochemistry, worth publication Inc., CBS Publication New Delhi.
5. Palmer T (1995). Understanding Enzymes, Prentice Hall, Ellis Harwood.
6. Stryer L (1999). Biochemistry (4<sup>th</sup>Edn.), Freeman Company, New York
7. Veerakumari L (2004). Bio Chemistry, MJP Publications.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| CO1       | Define the functions and properties of carbohydrates, lipids, amino acids, proteins and nucleic acids                       | K1              |
| CO2       | Classify the biomolecules according to their structures.  | K2              |
| CO3       | Sketch the basic structure of biomolecules and reactions involving them   | K3              |
| CO4       | Distinguish different types of sugars, fats, aminoacids and proteins based on the physical, chemical and biological aspects | K5              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with Pos

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | S   | S   | S   | S   | S   |
| CO2      | S   | M   | M   | S   | S   |
| CO3      | S   | S   | M   | M   | M   |
| CO4      | S   | S   | S   | S   | M   |

**S – Strong**

**M–Medium**

**L –Low**





| Program: B.Sc. Zoology  |                 |                        |              |   |
|-------------------------|-----------------|------------------------|--------------|---|
| Group A<br>Elective – I |                 | Course Code: 20U5ZOE01 |              | Course Title: Medical Lab<br>Technologies |
| Semester<br>V           | Hours/Week<br>5 | Total Hours<br>75      | Credits<br>3 | Total Marks<br>100                        |

### Course Objectives

1. To understand the role of Healthcare Professionals.
2. To impart basic knowledge on laboratory principles, procedures and techniques.

#### **UNIT-I**

General and personal care in the laboratory.

**Laboratory instruments:** Autoclave – Hot air oven – Incubators - water bath – Centrifuge – Refrigerator – pH meter – Hemoglobinometer- Cyclomixer – Laminar air flow – Albuminometer – Urea Meter and Urinometer.

#### **UNIT-II**

Preparation and uses of reagents – normal saline – Turkey's fluid – Hayem's fluid, – Leishman's stain – Wright stain - Carnoy's fluid – Bouvin's fluid – Acetocalamine – Methyl Violet 2B – Stain and Staining techniques.

#### **UNIT-III**

Composition of Blood – Anticoagulants (Types & Use) – RBC – WBC - Total count and Differential count in WBC- Erythrocyte Sedimentation Rate (ESR) – Platelet count – Clotting time – Bleeding time and Blood pressure apparatus.

#### **UNIT-IV**

Examination of urine and faeces – Microscopic examination of sediments. Collection and disposing sputum - Physical examination – Examination of cerebrospinal fluid – Semen analysis – Sperm motility – Sperm count and Morphology.

#### **UNIT-V**

Examination of parasites – *Trypanosoma Gambians*, *Leishmanian denoavani*, *Plasmodium*, *Endameba histolytica*, *Ascaris lumbricoids* and *Wuchereria bancrofti*.

#### **Text Books**

1. Dubey R C and Maheswari D K (2007). A Text book of Microbiology, S. Chand and Co. Publishers.
2. Mukherjee (2006). Medical Laboratory Technology Vol. I, II & III – Tata McGraw Hill Publ. Co.,



- Ochei (2000). Medical Laboratory Science – Theory and Practice – Tata McGraw Hill Publication, Co.,
- Ramnik Sood (1999). Medical Laboratory Techniques (MLT). (5<sup>th</sup>Edn.,) Jaypee Brothers Medical Publishers (P)Ltd.,
- Samuel K M (1992). Notes on Clinical Lab Techniques. M.K.G. Iyyer & Sons Publ. Co.,

#### Reference Books

- Gurumani N (2006). Research methodology for biological sciences MJP Publisher.
- Subramanian M A (2005). Biophysics (Principles and Techniques) MJP publishers, Chennai. techniques, (5<sup>th</sup>Edn.,) Burges Pub.Co.
- Unbriet W W, Burri Z H and Stamffier J F (1972). Manometric and Biochemical
- UpadhyayaA, Upathyaya K and Nath N (2003). Biophysical chemistry, Principles and Techniques, (3<sup>rd</sup>Edn.,), Himamalaya Publishing house.
- Veerakumari L (2006). Protein Sequencing in Bio informatics bioinstrumentation, MJP Publisher.

#### Course Outcome (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | List of Sample of collection in the Laboratory and recollect the importance of clinical laboratory test. | K1              |
| CO2       | Report the normal level of human blood and urine samples.  | K2              |
| CO3       | Use of practical skills in the field of clinical pathology.  | K3              |
| CO4       | Adopt knowledge about handling of specimens.   | K5              |
| CO5       | Investigate the application of Instruments in clinical experiment.                                       | K6              |

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

#### Mapping of COs with POs

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | S   | S   | M   | S   | M   |
| CO2      | S   | M   | M   | S   | S   |
| CO3      | M   | S   | M   | S   | M   |
| CO4      | M   | S   | S   | S   | M   |
| CO5      | M   | S   | S   | M   | S   |

S – Strong

M–Medium

L –Low



| Program: B.Sc. Zoology             |                         |                               |                      |  |
|------------------------------------|-------------------------|-------------------------------|----------------------|--|
| <b>Group – A<br/>Elective – II</b> |                         | <b>Course Code: 20UZO5E02</b> |                      | <b>Course Title: Biostatistics<br/>and Computational Biology</b> |
| <b>Semester<br/>V</b>              | <b>Hours/Week<br/>5</b> | <b>Total Hours<br/>75</b>     | <b>Credits<br/>3</b> | <b>Total Marks<br/>100</b>                                       |

### Course Objectives

1. To get a basic knowledge of statistical methods and computations in biology.
2. To study the application of information sciences [mathematics, statistics and computer sciences] in biology.
3. To study the application of information and analysis of biological data.

#### **UNIT-I**

Data Collection – Sources of Primary and Secondary data collection. Classification and Tabulations – Diagrammatic representation of data – Bar diagram – Pie diagram – Graphical presentation of data – Histogram – Frequency polygon – Frequency curve – Ogive – Pictograph.

#### **UNIT-II**

Measures of Central Tendency – Calculation of arithmetic mean – Median and Mode. Merits and demerits. Measures of dispersion – Standard deviation – Standard error and Student's t-test.

#### **UNIT-III**

Computer hardware and software. General maintenance of computer systems. Operating systems. Data processing and plotting – Excel presentations and Drawings. Power point and Word processors.

#### **UNIT-IV**

Computers assisted teaching (CAT) and labs: Integrations ICT in teaching learning – virtual learning resources. Molecular modelling – Image analysis – Cloud computing and Data mining.

#### **UNIT – V**

Bioinformatics: History – Definition and Scope - Data bases: Protein and DNA – FASTA tools and BLAST – GENBANK and EMBL.

#### **Text Books**

1. Pillai R S N and Bhagavathi V (2001). Statistics, S. Chand and Co., New Delhi.
2. Prasad S (2004). Elements of Biostatistics. Rastogi Publications, Meeruit, India.
3. Ramakrishnan P (2009). Biostatistics, Saras Publications, Nagercoil.



### Reference Books

1. Gupta S P (2006). Statistical methods. Sultan Chand and sons- 23, Educational Publishers, Daryagans, NewDelhi.
2. Palanisamy S and Manoharan M (1992). Biostatistics for biologist, Paramount Publications, Palani.
3. Parameshwaran R (1997). Computer applications in Business. S. Chand and Co., New Delhi.
4. Pradeep K Sinha and Priti sinha (1995). Computer Fundamentals, Concepts Systems and Applications.BPB Publications, New Delhi.
5. Rajaram V (2006).Fundamentals of Computers, (4<sup>th</sup>Edn). Prince Hall of India, Private Ltd., New Delhi.
6. SupratimChoudhuri (2014). Bioinformatics for Beginners. Tokyo AcademicPress.
7. Young S S (2001). Computerized Data Acquisition & Analysis for Life Sciences: A Hands-on Guide.Cambridge University Press.



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | Explain the Standard deviation, standard error and Student's T-test.                           | K2              |
| CO2       | Explain the measures of central tendency and dispersion like arithmetic mean, mode and median. | K2              |
| CO3       | Demonstrate the Applications and uses of Statistics.   | K3              |
| CO4       | Distinguish parts of Computers and associated devices of Computer Hardware.                    | K4              |
| CO5       | Investigate the internet and Computer interfacing with biological studies.                     | K6              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | S   | S   | S   | S   | M   |
| CO2      | S   | M   | S   | M   | M   |
| CO3      | S   | S   | S   | M   | L   |
| CO4      | S   | S   | M   | M   | S   |
| CO5      | S   | M   | M   | L   | L   |

**S – Strong**

**M–Medium**

**L –Low**



| Program: B.Sc. Zoology |                 |                        |              |                             |
|------------------------|-----------------|------------------------|--------------|-----------------------------|
| SBEC – III             |                 | Course Code: 20UZO5S03 |              | Course Title: Biotechnology |
| Semester<br>V          | Hours/Week<br>2 | Total Hours<br>30      | Credits<br>2 | Total Marks<br>100          |

### Course Objectives

1. To get knowledge about application oriented aspects.
2. To provide a platform to learn the deliberate use of living organisms for human welfare.
3. To study the importance of Environmental Biotechnology.

#### **UNIT-I**

History of Biotechnology – Scope of biotechnology major areas of Biotechnology. Organisms important in Biotechnology – Important of Bacteria and Virus.

#### **UNIT-II**

Basics of Genetic Engineering – Restriction Enzymes. Vectors – Plasmids – Phage vector (Lambda). Insertion vector – Replacement vectors - Cosmids – Plasmids and Lambda phage.

#### **UNIT-III**

Gene Cloning in Prokaryotes and Eukaryotes. Polymerase chain reaction (PCR) – Blotting techniques (Southern). Application of the cloned genes with diagnosis and prevention of diseases. Production of Monoclonal antibodies and application.

#### **UNIT-IV**

Principles and techniques of animal cell culture – Protoplast fusion in prokaryotes and Eukaryotes organisms – Importance of cell line culture.

#### **UNIT-V**

Antisense RNA Technology – Oncogene animal culture – Transgenic methods – Retroviral methods – Microinjection methods – Embryonic stem cell methods – Transgenic Fish and Sheep. Applications of Biotechnology in Agriculture – Industries and health.

#### **Text Books**

1. Dubey R C (2012). A text books of Biotechnology, S. Chand and Company, New Delhi.
2. Glick J and Jack J Pasternak (2010). Molecular Biotechnology-Bernard American Society for Microbiology, (4<sup>th</sup> Ed.), Canada.
3. Kumaresan V (2009). Biotechnology, Saras Publications, Kanyakumari.
4. Satyanarayana U (2008). Biotechnology, Books and AlliedLtd.
5. Singh B D (2015). Biotechnology, Kalyani Publishers.



### Reference Books

1. Brown T A (2001). Gene cloning and DNA analysis, (4<sup>th</sup> Ed.,) Blackwell Publishing.
2. Jogdand S N (2005). Advances in Biotechnology, (5<sup>th</sup>Edn.,) Published by Himalaya publishing house.
3. John Tooke and Tkurtl (1983). Recombinant DNA, A short course James D Watson, Scientific American Book.
4. Sadasivam S (2004). Biochemical methods, New Age International Publications.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| CO1       | List of various Applications of Biotechnology.                    | K1              |
| CO2       | Discuss the Hybridoma technology as well as Enzyme biotechnology. | K2              |
| CO3       | Use the DNA Recombinant technology.                               | K3              |
| CO4       | Defend the industrial and environmental biotechnology.            | K5              |
| CO5       | Investigate the Stem cell biotechnology.                          | K6              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | S   | S   | M   | S   | M   |
| CO2      | M   | S   | S   | M   | S   |
| CO3      | S   | S   | M   | S   | M   |
| CO4      | S   | M   | S   | M   | S   |
| CO5      | S   | M   | M   | S   | M   |

**S – Strong**

**M–Medium**

**L –Low**



| Program: B.Sc. Zoology |                 |                        |              |                                  |
|------------------------|-----------------|------------------------|--------------|----------------------------------|
| SBEC – IV              |                 | Course Code: 20UZO5S04 |              | Course Title:<br>Vermitechnology |
| Semester<br>V          | Hours/Week<br>2 | Total Hours<br>30      | Credits<br>2 | Total Marks<br>100               |

### Course Objectives

1. To impart training on Earthworm culture technology.
2. To create knowledge on Self - Employment opportunity.

#### UNIT-I

**Earthworms:** Systematic position and taxonomy – habitat – Classification of Earthworms (epigeic, anecic and endogeic) – Physical effects and chemical effects of earthworms on soil.

#### UNIT-II

**Biology of earthworm:** External features - Digestive system – Excretory system and reproductive system – Life cycle of *Perionyxexcavatus* (cocoons, juveniles, non-Clitellates, Clitellates). Earthworm – Collection – Transport and Storage.

#### UNIT-III

**Vermiculture:** Worms used for vermiculture – Earthworm Breeding – Preparation of vermibed and its types – Harvesting methods of vermicompost – Vermiwash collection composition and use.

#### UNIT-IV

**Vermicompost and Vermicast:** Chemical composition – Application as biofertilizer – Field Studies with crops paddy – Cotton and bendi and Yield improvement.

#### UNIT-V

**Economics of vermiculture:** In sustainable agriculture – Organic Farming – Recycling of Wastes through vermicomposting – Earthworms as Medicine – Vermicomposting in the world Scenario.

#### Text Books

1. Arun K Sharma (2002). A hand book of Organic Farming, Agrobios, Jodhpur, India
2. Bhatnagar R K and Palta R K (1996). Vermiculture and Vermicomposting. Kalyani
3. Gupta P K (2008). Vermicomposting for Sustainable Agriculture. Agrobios. India. Publishers, New Delhi.
4. Ismail S A (2005). The Earthworm book, Other India press, India.





### Reference Books

1. Edwards C A and Lofty J R (1977). Biology of Earthworms Chapman and Hall
2. Lee K E (1985). Earthworms: Their ecology and Relationship with Soils and Land Limited, Chennai.Ltd., London.
3. Satchel J E (1983). Earthworm Ecology Chapman Hall, London.
4. Sultan Ismail (1997). Vermicology-The Biology of Earthworm, Orient Longman Use, Academic Press, Sydney.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | Understand the Earthworm- types, classification, organization and lifecycle.                         | K1              |
| CO2       | Knowledge about sustainable agriculture, organic farming and waste management using vermitechnology. | K2              |
| CO3       | Understand the rearing and harvesting techniques in sericulture.                                     | K3              |
| CO4       | Study all aspects related to Vermicomposting and the economics of Vermiculture.                      | K4              |

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### Mapping of COs with POs

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | S   | S   | S   | M   | S   |
| CO2      | M   | S   | M   | S   | M   |
| CO3      | M   | S   | S   | M   | S   |
| CO4      | S   | S   | M   | S   | M   |

S – Strong

M–Medium

L –Low



| Program: B.Sc. Zoology |                               |                          |   |                           |
|------------------------|-------------------------------|--------------------------|---|---------------------------|
| <b>Core – VIII</b>     | <b>Course Code:</b> 20UZO6C08 |                          | <b>Course Title:</b> Ecology and Ethology |                           |
| <b>Semester</b><br>VI  | <b>Hours/Week</b><br>5        | <b>Total Hours</b><br>75 | <b>Credits</b><br>5                       | <b>Total Marks</b><br>100 |

### Course Objectives

1. To know the fundamental principles that governs the functioning of the environment.
2. To understand the concept of ecosystem and balance of nature.
3. To assess the relationship between environment and organisms.
4. To study the learning process of animals and their behavioral changes.

#### **UNIT-I**

Environment – Abiotic factors – Atmosphere and temperature. Limiting factors – Leibig’s law and Shelford’s law. Biotic factors - Inter specific animal relationship (Symbiosis, Mutualism, and Commensalism). Biogeochemical cycle – Oxygen – Carbon – Nitrogen and Phosphorus.

#### **UNIT-II**

Ecosystem – Structure and functions – Food chain – Food web – Ecological pyramids. Community – Definition – Types – Characteristics – Stratification – Niche – Ecotone and Edge effect. Ecological succession – Types – Pattern – Significance.

#### **UNIT-III**

Habitat – Lentic. Marine – Stratification - Intertidal shores – Deep Sea. Terrestrial – Desert. Ecological pollution – Air – Water-Noise and Thermal Pollution.

#### **UNIT-IV**

Ethology – Definition – History – Scope. Learning behavior – Types – Neural mechanism. Chronobiology – Biological clock - Circadian rhythm. Visual communication – Postures and gestures of humans.

#### **UNIT-V**

Pheromones and behaviour. Echolocation in Bats. Territorial behaviour of animals. Speech – Language development in Bonobo and Chimpanzees.

#### **Text Books**

1. Agarwal V K (2002). Simplified course in B.Sc., Zoology – Ecology and Ethology.
2. Rastogi V B and Jayaraj M S (1998). Animal Ecology and Distribution of Animals, Kedar Nath Ram Nath Publishers, Meerut.
3. Saharia V B (2009). Wildlife in India. Nataraj Publications, Dehradun.



4. Verma P S and Agarwal V K (2011). Environmental Biology, Rastogi Publication, Meerut.

### Reference Books

1. Eugene P Odum and Gary W Barrett (2005). Fundamentals of Ecology, (5<sup>th</sup>Edn), Cengage Learning Publishers.
2. Gundevia H S and Hare Govind Singh (2013). A Textbook of Animal Behavior, (7<sup>th</sup>Edn) S. Chand Publishing, New Delhi.
3. Rastogi V B and Jayaraj M S (1998). Animal Ecology and Distribution of Animals, Kedar Nath Ram Nath Publishers, Meerut.
4. Sanji Chattopadhyay (2012). Life Evolution, Adaptation and Ethology, (3<sup>rd</sup>Edn), Books and Allied Pvt. Ltd., Kolkata.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | Defined the information and services that improve our natural environment and human lives.   | K1              |
| CO2       | Explain the relationship between predators and pre   | K3              |
| CO3       | Explain the importance of evolution for animal behaviour.  | K3              |
| CO4       | Investigate roles as broadly-educated leaders that have strong collaboration skills and can communicate effectively to address environmental issues. | K6              |

Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### Mapping of COs with POs

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | S   | S   | M   | M   | L   |
| CO2      | S   | S   | S   | M   | M   |
| CO3      | S   | S   | M   | S   | L   |
| CO4      | S   | S   | M   | M   | L   |

S – Strong

M–Medium

L –Low



| Program: B.Sc. Zoology |                 |                        |              |                         |
|------------------------|-----------------|------------------------|--------------|-------------------------|
| Core – IX              |                 | Course Code: 20UZO6C09 |              | Course Title: Evolution |
| Semester<br>VI         | Hours/Week<br>5 | Total Hours<br>75      | Credits<br>5 | Total Marks<br>100      |

### Course Objectives

1. To obtain the knowledge of animal behaviour.
2. To understand the concept of biological clock and circadian rhythm.
3. To students can learn the processes of origin of life.

#### **UNIT-I**

Introduction, Historical aspects of Evolutionary Concept – Origin of life – Geological time Scale. Living Fossils – Peripatus and Archaeopteryx.

#### **UNIT-II**

Evidences of Evolution – Morphological – Anatomical – Embryological and Biochemical.

#### **UNIT-III**

**Theories of Evolution:** Lamarckism Neo – Lamarckism – Darwinism – Neo- Darwinism  
Modern concept of natural selection – Species Concept – Origin of species and Isolating Mechanisms. Theories of evolution De Vries – Mutation theory.

#### **UNIT-IV**

Convergent and Parallel evolution – Micro and macro evolution – Adaptive radiation in mammals – Mimicry and colouration. Phylogenetic Trees of Invertebrates and Vertebrates.

#### **UNIT- V**

Evolution in Horse – Elephant – Man and Future Evolution of Human.

#### **Text Books**

1. Arumugan N (2017). Organic Evolution, Saras. Publication.Kanniyakumari
2. Gopalakrishnan T S, Itta Sambasivaiah, KamalakaraRao A P (1970). Principles of Organic Evolution, Pearl Publications, Madras.
3. Veer Bala Rastogi (2016). Organic Evolution, Ramnath Publishers.

#### **Reference Books**

1. Dobzhansky (1977). Evolution, W.H. Freeman and Co. San Francis CO.
2. Dowdeswell W H (1956). The mechanism of Evolution, Helmann, London.
3. Gupta P K (1988). Cytology, Genetics & Evolution (5<sup>th</sup>Edn) Rastogi Publications Shivaji



Road, Meerut, India.

4. Huxley J (1942). Evolution, The modern synthesis, Harpers N.Y.
5. Mayr E L (1963). Animal Species and Evolution, Harvad Uni., Press.
6. Minkoff E C (1983). Evolutionary Biology, Addition Wesley Publishers.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| CO1       | Get knowledge about the chronology of animals.      | K1              |
| CO2       | Understand the modern synthetic theory of evolution | K2              |
| CO3       | Apply the reproductive behavior of animals          | K3              |
| CO4       | Analyze the significance of geological time scale   | K4              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | S   | S   | S   | M   | M   |
| CO2      | S   | S   | M   | M   | S   |
| CO3      | S   | M   | M   | S   | S   |
| CO4      | S   | S   | S   | M   | S   |

**S – Strong**

**M–Medium**

**L –Low**



| Program: B.Sc. Zoology |              |                        |           |                                     |
|------------------------|--------------|------------------------|-----------|-------------------------------------|
| Core – X               |              | Course Code: 20UZO6C10 |           | Course Title: Developmental Biology |
| Semester VI            | Hours/Week 5 | Total Hours 75         | Credits 5 | Total Marks 100                     |

### Course Objectives

1. To get knowledge about theories of development and gametogenesis.
2. To study the process of fertilization and cleavage of animals.
3. To understand the embryonic developmental stages and extra embryonic nutrition of animals.

#### **UNIT-I**

**Gametogenesis:** Spermatogenesis – Structure and types of mammalian sperm. Oogenesis, Structure of Ovum. Fertilization – Physico – Chemical changes in fertilization and its significance- Parthenogenesis.

#### **UNIT-II**

Types of Eggs and egg membranes - Cleavage – Planes and patterns of cleavage. Morulation, Blastulation in Frog and Chick – Gastrulation in Frog and Chick and Fate map.

#### **UNIT-III**

Organogenesis – Brain and Eye formation in frog. Metamorphosis in Frog and Insect –Hormonal Control of metamorphosis in insects. Foetal membranes in chick and Mammals and Placenta in Mammals.

#### **UNIT-IV**

Gradient theory. Nuclear transplantation in Amphibians. Embryonic induction. Organizer – Types and experimental evidences. Regeneration in invertebrates (Planaria) and Chordates (Frog).

#### **UNIT- V**

Infertility – Cause and methods of treatment – Embryo splitting and Test Tube Baby. Twins – Identical and non-identical. Artificial insemination – Super Ovulation techniques and *IVF*.

#### **Text Books**

1. Arumugam N (2010). A text book of Embryology, Saras Publications. Kanniyakumari
2. Verma P S and V K Agarwal (2012). Chordate Embryology, S. Chand Company Ltd., New Delhi.



### Reference Books

- Balinsky B I (1981). Introduction to Embryology, Holt Saunders International, New York.
- Berril N J (1986). Developmental Biology, Tata McGraw-Hill Publication, New Delhi.
- Bodemes C W (1968). Modern Embryology, Holt Rinebert Winston, New York.
- Ebert J C (1965). Interacting systems in Development, Holt Rainbart and Winston, New York.
- Gilbert S F (2009). Developmental Biology, Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts.
- Kalthoff K (1996). Analysis of Biological Development, McGraw-Hill Publishers,
- Needham J (1945). A History of embryology, Burgess, Minneapolis. New York.
- Rayam CP (1961). An outline of developmental Physiology, (1<sup>st</sup> Edn.), Bergman, London.
- Rough R (1945). Experimental Embryology, Burgess, Minneapolis.
- Wolpert L (2007). Principles of Development, Oxford Publication.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| CO1       | Study the laws and theories of development and gametogenesis.   | K1              |
| CO2       | Understand the process and different methods of fertilization.  | K2              |
| CO3       | Apply the knowledge on various developmental stages of animals. | K3              |
| CO4       | Analyze the importance and knowledge on embryonic nutrition.    | K4              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | S   | S   | S   | M   | M   |
| CO2      | S   | S   | S   | M   | M   |
| CO3      | S   | M   | M   | S   | S   |
| CO4      | S   | S   | M   | M   | L   |
| CO5      | S   | M   | M   | L   | L   |

**S – Strong**

**M–Medium**

**L –Low**



| Program: B.Sc. Zoology           |                        |                               |                     |   |
|----------------------------------|------------------------|-------------------------------|---------------------|---|
| <b>Group-B<br/>Elective – II</b> |                        | <b>Course Code:</b> 20UZO6E02 |                     | <b>Course Title:</b> Immunology<br>and Microbiology |
| <b>Semester<br/>VI</b>           | <b>Hours/Week</b><br>5 | <b>Total Hours</b><br>75      | <b>Credits</b><br>3 | <b>Total Marks</b><br>100                           |

### Course Objectives

1. To update basic knowledge on microorganisms.
2. To understand the economic importance of microbes in relation to agriculture, industry and medicine.
3. To analyze and inculcate the fundamental knowledge on immune system and immunological responses to antigens.

### UNIT- I

#### IMMUNOLOGY

Lymphoid organs (Primary and Secondary) – Cells of the immune system (Lymphocytes - Macrophages – Eosinophil - Basophil and Neutrophils) – Antigen. Presenting cells (Mast cells and platelets) – Types of Immunogloblins and their function.

#### UNIT- II

Types of antigen and antibody reaction – Hypersensitivity (Immediate and delayed). Auto immune diseases (Classification and common auto immune diseases) Immunity (innate - and acquired) – Immunization (active and passive).

#### UNIT- III

##### Microbiology

History and scope of microbiology – Classification of microbes – Structure of Bacteria (*E-coli*) – Structure of virus (T4 phage) – Sterilization – Bacterial Growth (Methods – Rate and Growth curve) Different types of culture Media – Bacterial culture Techniques and Culture methods.

#### UNIT- IV

**Food spoilage:** Bread – Meat – Vegetables. Food poisoning – Food preservation and food additives Bacteriological examination of milk: Grading milks – Milk product – Milk borne diseases.



**UNIT -V**

**Food borne diseases:** Microbial food poisoning by *Salmonella* and *Clostridium botulinum* (Botulism). Measures to prevent microbial food poisoning. Food infection – Food borne diseases – Diarrhoea – Dysentery – Typhoid and Cholera.

**Water borne diseases:** Hepatitis - Gastro enteritis – *Camphlobacter* – Diarrhoes, *Gardialamblia* - *Cryptosporidiosis* Cholera.

**Air borne diseases:** Common cold – Tuberculosis – Pneumonia – Diphtheria.

**Text Books**

1. Arumugam N. (2008) Microbiology & Immunology, Saras Publication, Nagercoil, Tamilnadu, India.
2. Verma P S, Tyagi and Agarwal (1997). Microbiology, Chand & Company Ltd.

**Reference Books**

1. Dubey R C and Maheswari D K (2006). A Text Book of Microbiology, Cambridge University Press.
2. Mani A, Selvaraj A M, Narayanan L M and Arumugam, N (2007). Microbiology, Saras Publications.
3. Mount (2004). Bioinformatics.CBS Publication.
4. Ryan K J & Ray C G (2004). Medical Micro Biology. TaTa-McGrawhill Publisher.
5. Stephen Misener & Stphen A Krawetz (2003). Bioinformatics Methods and Protocols. Humana Press.

**Course Outcomes (COs)**

On successful completion of the course, the students will be able to

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| CO1       | Gain knowledge about culture techniques, staining and Microbiological examination of food stuffs. | K1              |
| CO2       | Acquire about immunological importance of animals.  | K2              |
| CO3       | Study the basic bioinformatics tools and it uses.   | K3              |
| CO4       | Know the global development in computer applications.   | K4              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**



**Mapping of COs with POs**

| <b>PO<br/>CO</b> | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> |
|------------------|------------|------------|------------|------------|------------|
| <b>C01</b>       | S          | S          | M          | M          | S          |
| <b>C02</b>       | M          | S          | S          | S          | M          |
| <b>C03</b>       | S          | S          | S          | S          | M          |
| <b>C04</b>       | M          | M          | S          | S          | S          |

**S – Strong**

**M–Medium**

**L –Low**



| Program: B.Sc. Zoology |              |                        |           |                                       |
|------------------------|--------------|------------------------|-----------|---------------------------------------|
| SBEC – V               |              | Course Code: 20UZO6S05 |           | Course Title: Public Health & Hygiene |
| Semester VI            | Hours/Week 2 | Total Hours 30         | Credits 2 | Total Marks 100                       |

### Course Objectives

1. To inculcate knowledge on health education and lifestyles.
2. To create awareness about the importance of environment for healthy life.
3. To educate the students in relation to health education programmes of Public importance.
4. To impart awareness on public health and Hygiene.
5. To create knowledge on Health education.

#### **UNIT-I**

Introduction to food. Composition and nutritive value of Cereals (Rice, Wheat, Millets, Ragi, Pearl millet). Nutritional deficiency disease – Anaemia, Scurvy

#### **UNIT-II**

Composition and medical value of Ginger, Black pepper and Turmeric. Dental Care and eye care

#### **UNIT-III**

Communicable diseases – Dengue fever, Malaria, Amoebiasis, Viral fever and AIDS.

#### **UNIT-IV**

Non-communicable diseases – Stroke, Diabetes, Obesity and Cancer

#### **UNIT-V**

Awareness on Diarrhea, Alcoholism, Smoking, Tobacco chewing, Ulcer and Jaundice

#### **Text Books**

1. Chatwick R (2003). Functional Foods, Springer.
2. Guthrie A H (1986). Introductory Nutrition, (6<sup>th</sup>Edn), The C.V. Mos by Company.
3. Longree K (1973). Food Service Sanitation, John Wiley and Sons, NewDelhi.
4. Mary K Schmidl & Theodore P Labuza (2000). Essential of Functional Foods Culinary and Hospitality Industry Publications Services.
5. Robinson C H (1998). Normal and the Therapeutic Nutrition, The Oxford and IBH Publishing Co., London.
6. Srilakshmi B (1977). Dietetics, New Age International (P) Ltd., Chennai.
7. Srilakshmi (1998). Food Science, New Age International Ltd., Chennai.
8. Murgesh. N. (2008). Health Education and Community Pharmacy. Sathya Publishers, Madurai



### Reference Books

1. Dubey R C and Maheswari D K (2007). Text Book of Microbiology, S. Chand & co. Publ. New Delhi–India.
2. Park and Park (1995). Text book of Preventive and Social Medicine, Banarsidas Bhanot Publ., jodhpur-India.
3. Singh H and Rastogi P (2009). Parasitology, Rastog iPubl. India.
4. Verma S (1998). Medical Zoology, Rastogi Publications, Meerut- India.
5. Jill Varnes and Stephen. D C. (2000). Health. Bud Getchell, Rurtypipin. Health and Company, Massachusetts.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | Get knowledge about the concept of health.                                   | K1              |
| CO2       | Understand the role of Nutrition in Man.                                     | K2              |
| CO3       | Study various environmental pollution and diseases and their impacts on Man. | K3              |
| CO4       | Create awareness on prevention and control of diseases.                      | K6              |

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

### Mapping of COs with Pos

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | S   | S   | M   | S   | M   |
| CO2      | S   | S   | M   | S   | M   |
| CO3      | S   | M   | S   | S   | S   |
| CO4      | S   | S   | M   | S   | M   |

S – Strong

M–Medium

L –Low



| Program: B.Sc. Zoology |                 |                        |              |                               |
|------------------------|-----------------|------------------------|--------------|-------------------------------|
| SBEC – VI              |                 | Course Code: 20UZO6S06 |              | Course Title: Poultry Science |
| Semester<br>VI         | Hours/Week<br>2 | Total Hours<br>30      | Credits<br>2 | Total Marks<br>100            |

### Course Objectives

1. To impart training on Modern Poultry Farming Technology
2. To create knowledge on self-employment opportunity.

#### **UNIT-I**

History and importance of Poultry farming, Role of the Poultry in rural development, employment potential – Economics and contribution to national productivity – Egg production, manure as by-product. Physiology of poultry birds with reference to digestive and Reproductive system.

#### **UNIT-II**

Breeds of poultry birds and scientific methods of breeding Hybrid and cross breed. Indian and exotic selecting chicks and parents for production factors in selection – Hatching – selecting eggs for hatching – Maintenance of temperature and humidity sterilization of room during hatching and separation and selling.

#### **UNIT-III**

Poultry house and equipment- space requirement – Types of house – Number of birds – Equipment for feeding – Protection from enemies and Adverse conditions.

#### **UNIT-IV**

Nutrition of Poultry birds – Requirement according to age feed formulation – Classification of feed stuffs- Milling by products – Availability of raw materials and their cost-Food grinders and mixtures, use of antibiotics

#### **UNIT-V**

Brooding and rearing- Sexing – Vaccination-Natural and artificial breeding – types of brooding, temp. Requirement culling. De breaking of poultry – Characters of good layers and broilers – rearing of chicks.

#### **Text Books**

1. Keith Wilson (2007). A Hand book of poultry practice. (2<sup>nd</sup>Edn), Agrobios (India), Jodhpur.
2. Norris Elye (2005). The Poultry Science L.C.R. Biotech books.Delhi.



### Reference Books

1. Banerjee C C (1992). Poultry III Edition.
2. Gnanamani M R (1978). Poultry Keeping, Deepana Publications.
3. Shukla G S and Upadhyay V B (2004). Economic Zoology, Rastogi Publication, Meerut-India.
4. Sing R A (1996). Poultry production. Kalyan publishers.

### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement  | Knowledge Level |
|-----------|---|-----------------|
| CO1       | Get knowledge about the importance of poultry farming           | K1              |
| CO2       | Understand significant diseases in poultry production.          | K2              |
| CO3       | Apply the knowledge in types of incubators for poultry breeding | K3              |
| CO4       | Evaluate the quality of poultry meat and eggs.                  | K5              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with Pos

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | S   | S   | S   | M   | M   |
| CO2      | S   | S   | M   | M   | M   |
| CO3      | S   | M   | S   | M   | S   |
| CO4      | S   | S   | M   | M   | S   |

S – Strong

M – Medium

L – Low



| Program: B.Sc. Zoology      |                        |                               |                     |   |
|-----------------------------|------------------------|-------------------------------|---------------------|---|
| <b>Core Practical – III</b> |                        | <b>Course Code: 20UZO6P03</b> |                     | <b>Course Title: Animal Physiology- Genetics and Biochemistry</b> |
| <b>Semester</b><br>VI       | <b>Hours/Week</b><br>3 | <b>Total Hours</b><br>45      | <b>Credits</b><br>4 | <b>Total Marks</b><br>100   |

### Course Objectives

1. To understand the identification of Nitrogenous excretory products.
2. To make the students understand various principles of heredity.
3. To create the knowledge about the application of genetic principles in different populations.
4. To acquire skill of analyzing carbohydrates and amino acids.
5. To provide practical knowledge about the characterization of lipids.
6. To learn the methodology of separation of amino acids by paper chromatography.

### **I. Major Practicals**

1. Amylase activity in relation to pH in human saliva.
2. Ciliary activity in fresh water mussels (Q10).
3. Estimation of the rate of O<sub>2</sub> consumption in fish / Crab with reference to the bodyweight.
4. Estimation of uric acid – Caraway's method.

### **II. Minor Practicals**

1. Qualitative analysis of Carbohydrate, Proteins and Fats.
2. Identification of Nitrogenous excretory products.
3. Estimation of Phosphorus - Fiske & Sub barrow method.

### **III. Spotters**

Observation of common Mutants of Drosophila – Kymograph – Sphygmomanometer – pH Meter – Haemocytometer and Mono and Dihybrid test cross (Diagrammatic representation) and Paper chromatography.

### **Submission of Practical Record**



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | Student gain the fundamental knowledge of animal Physiology  | K1              |
| CO2       | Understanding the basic concept of various physiologically Instruments                                     | K2              |
| CO3       | Analyse of basic concept of genetics and law of inheritance  | K4              |
| CO4       | Practice the qualitative analysis of different carbohydrates and amino acidsthrough individual experiments | K5              |
| CO5       | Calculate iodine number of lipids, thereby characterizing them   | K6              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | M   | S   | S   | S   | S   |
| CO2      | S   | S   | S   | S   | S   |
| CO3      | M   | M   | M   | S   | S   |
| CO4      | S   | S   | M   | M   | S   |
| CO5      | S   | S   | S   | S   | M   |

**S – Strong**

**M–Medium**

**L –Low**





| Program: B.Sc. Zoology     |                     |                               |                  |  |
|----------------------------|---------------------|-------------------------------|------------------|--|
| <b>Core Practical – IV</b> |                     | <b>Course Code: 20UZO6P04</b> |                  | <b>Course Title: Ecology and Ethology, Evolution and Developmental Biology and MLT</b> |
| <b>Semester VI</b>         | <b>Hours/Week 3</b> | <b>Total Hours 45</b>         | <b>Credits 4</b> | <b>Total Marks 100</b>   |

### Course Objectives

1. To study the eco factors on the morphology and distribution of organisms.
2. To study the different development stages of chick embryos.
3. To study the application of information sciences (mathematics, statistics and computer sciences) in biology.
4. To study the impact of eco factors on the morphology and distribution of organisms.

#### **I. Major Practicals**

1. Estimation of Dissolved oxygen content in the given water sample (Winkler method).
2. Estimation of salinity in given water sample.
3. Study of Marine/Freshwater Planktons.

#### **II. Minor Practicals**

1. Estimation of urine sugar.
2. Bleeding time.
3. Clotting time.

#### **III. Spotters**

Slides of different developmental stages of chick embryos (24, 48, 72, 96 Hrs.) Slides of blastula and gastrula of frog (Morula -Early gastrula -Yolk plug stage- Late gastrula) Placenta of Sheep / Pig/ Rat. Fossils any two Description and uses of autoclave - Hot air oven – Incubator – Centrifuge – pH meter – Colori meter.

**Submission of Field report.**

**Submission of Practical Record not.**



### Course Outcomes (COs)

On successful completion of the course, the students will be able to

| CO Number | CO Statement   | Knowledge Level |
|-----------|--|-----------------|
| CO1       | Get practical knowledge about the species identification, diversity and their ecological significance. | K1              |
| CO2       | Understand about the species diversity and water pollution due to anthropogenic activity.              | K2              |
| CO3       | Apply practical knowledge on plankton analysis.  | K3              |
| CO4       | Analyze about practical and filed knowledge in relation to environment management.                     | K4              |

**K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create**

### Mapping of COs with POs

| PO<br>CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|----------|-----|-----|-----|-----|-----|
| CO1      | M   | S   | S   | S   | M   |
| CO2      | M   | M   | M   | S   | S   |
| CO3      | S   | M   | S   | S   | S   |
| CO4      | S   | S   | S   | M   | S   |

**S – Strong**

**M–Medium**

**L –Low**