

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN**  
**(AUTONOMOUS)**  
**DEPARTMENT OF ZOOLOGY**  
**B.Sc. DEGREE COURSE IN ZOOLOGY**  
**CHOICE BASED CREDIT SYSTEM (OBE PATTERN)**  
**Rules and Regulations, Course Scheme and Scheme of Examination governing the B.Sc.**  
**Degree Course in ZOOLOGY**  
**(For those admitted in June 2018 and later)**

## **I. COLLEGE**

### **Vision**

- ✓ To evolve into a center of excellence in higher education through creative and innovative practices to social equity for women.

### **Mission**

- ✓ To provide sufficient learning infrastructure to the students to pursue their studies.
- ✓ To provide good opportunity for higher education and conducive environment to the students to acquire education.
- ✓ To provide quality academic programs training activities and research facilities.
- ✓ To facilitate industry-institute interaction.

## **II. DEPARTMENT**

### **Vision**

- ❖ Provide a sound education in basic science
- ❖ Transform society through the empowerment of women
- ❖ Provide inexpensive educational services to the weaker sections of society
- ❖ Inculcate respect for nature and concern for ethical values among students through good and scientific educational practices.
- ❖ Recognizing the essential roles of science and biology in the lives of citizens today and tomorrow, we emphasize biological literacy in our teaching and outreach programs.

### **Mission**

- To impart to the students the contemporary advancements in life sciences.
- To impart a global perspective and such skills among students that benefit humanity.
- To promote the discovery and broad communication of knowledge about the biology of animals including their taxonomy, evolution, physiology, cell, molecular and biochemical make up, interaction with their environments and its zoogeographical realms.
- To develop research aptitude and a scientific advancement.
- Reinvent ourselves in response to the changing demands of society with high moral values as a good citizen

### III. AIM AND SCOPE OF THE COURSE

- ❖ To instill knowledge across different areas of animal science.
- ❖ Provides an opportunity to familiarize with the life cycles and mode of reproduction in different animal groups.
- ❖ The topics included in different units of different papers would enable the students to develop technical skills in zoological and allied branches.
- ❖ Skill based subjects like Ornamental fisheries, Agriculture Entomology, Sericulture, Apiculture, Aquaculture, Biotechnology, Poultry Science and Vermiculture Technology have been included in order to provide opportunities in employment and research in Government and Private organizations.
- ❖ There is also scope for self-employment for the students.
- ❖ □ Students will understand the importance of animals in the biosphere.
- ❖ Practicals included in the syllabus will improve the skills of students in microscopy, observation, drawing and laboratory techniques.

### IV. PROGRAMME OUTCOME

- Attained the knowledge relating to Invertebrate, Chordate, Cell biology, Genetics, Animal physiology, Biotechnology and Biochemistry
- Progression to UG education in Zoology, Sericulture, Agriculture Entomology, Biotechnology, bio informatics, bio chemistry, microbiology and Human genetics,
- The Students get employment by industries/self employment in poultry, Apiculture, ornamental fisheries, Sericulture and Aquaculture.

### V. PROGRAMME SPECIFIC OUTCOMES

- **PSO1:** The student should acquired the knowledge with facts and information related to various aspects in biological sciences and applied sciences
- **PSO2:** The student to understanding the basic concepts, diversity of animals and their classification
- **PSO3:** the students received the acquire the basic laboratory skill like cell counting and mounting of animals cells
- **PSO4:** The students are get overall knowledge about the adaptations of animals on different habitat.

### VI. SALIENT FEATURES

- ❖ Course is specially designed for self employment.
- ❖ Special Guest lectures from Government Officials, Scientists, Professors and Research Experts will be arranged.
- ❖ Special Industry Orientations and Training are parts of the Degree Course.
- ❖ Project work is included in the syllabus to enhance conceptual, analytical & deductive skills.

## VI. ELIGIBILITY FOR ADMISSION

Candidates seeking admission into the B.Sc. Degree course in Zoology must have passed the Higher Secondary Examinations, conducted by the Board of Higher Secondary Education, Government of Tamil Nadu or any other examinations accepted by the Syndicate of the Periyar University Salem as its equivalent with Zoology or Biology and Chemistry as course subjects in part III.

## VII. DURATION OF THE COURSE

- The duration of the course shall be three academic years comprising of six semesters in two semesters for each academic years.
- Each semester consists of 90 working days.

## VIII. CONTINUOUS INTERNAL ASSESSMENT (CIA)

The performance of the students will be assessed continuously and the Internal Assessment Marks for theory will be as under:

1. Average of two Tests - 15 Marks
2. Assignment - 5 Marks
3. Attendance - 5 Marks

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**Total = 25 Marks**

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Internal Assessment Marks for practical will be as under:

1. Attendance - 10 Marks
2. Observation Note - 10 Marks
3. Model Exam - 20 Marks

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**Total = 40 Marks**

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### Attendance Breakup

THEORY:

Range	Marks
76-80	1
81-85	2
86-90	3
91-95	4
96-100	5

PRACTICALS:

Range	Marks
76-80	2
81-85	4
86-90	6
91-95	8
96-100	10

## **IX. DISTRIBUTION OF MARKS**

### **THEORY:**

Internal Assessment - 25 marks

External Examination - 75 marks

### **PRACTICALS:**

Internal Assessment - 40 marks

External Examination - 60 marks

## **X. ATTENDANCE**

Each student must put in a minimum attendance of 75% of working days of the college in each semester so as to become eligible to appear for the Terminal Examinations. A student of the first or second year under-graduate class should, in addition to this, put in a minimum attendance of 75% in any of the co-curricular activities namely Physical Education, N.S.S., YRC and Red Ribbon Club in each semester to eligible to write the examinations in the respective semesters. Shortage of attendance in co-curricular activities Physical Education, N.S.S., YRC and Red Ribbon Club should be compensated in the ensuing semesters to become eligible to write the Terminal Examinations concerned.

Shortage of attendance in regular classes on the part of any student, not exceeding 10% below the prescribed minimum of 75% may be condoned on medical grounds. Such condonation shall be granted by the Principal on merits. The application for condonation shall be accompanied by a condonation fee, prescribed by the Principal. If a student earns less than 75% attendance in the regular classes in a particular semester and is found either ineligible for condonation of shortage of attendance or is not granted condonation, then the student will not be permitted to appear for the Terminal Examinations and the student will have to repeat that semester.

## **XI. TRANSITORY PROVISION:**

Candidates who were admitted to the UG course of study before 2017-2018 shall be permitted to appear for the examinations under those regulations for a period of three years i.e., up to and inclusive of the examination of April/May 2018. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

## **XII. SYLLABUS WITH EFFECT FROM: 2018-2019 onwards**

**COURSE SCHEME AND SCHEME OF EXAMINATIONS**  
**B.Sc. DEGREE COURSE IN ZOOLOGY**  
**CHOICE BASED CREDIT SYSTEM (OBE PATTERN)**  
**(For those admitted in June 2018 and later)**

Sem	Subject Code	Part	Course	Subject Title	HRS/Week	Credit	Int. Mark	Ext. Mark	Mark
I	18U1LT01	I	Languages	Tamil or anyone Language – I	5	3	25	75	100
	18U1LE01	II	Languages	Communicative English I	5	3	25	75	100
	18U1ZOC01	III	Core I	Invertebrata	6	5	25	75	100
	18U2ZOC01	III	Core Practical-I	Invertebrata & Chordata	3	-	-	-	-
	18U1BOA01	III	Allied Paper	Allied Botany Theory-I	4	3	25	75	100
	18U2BOAP01	III	Allied Practical-I	Allied Botany Practical	3	-	-	-	-
	18U1VE01	IV	Value Education	Yoga- Value Education	2	2	25	75	100
			Library		1	-	-	-	-
			Sports		1	-	-	-	-
<b>Total</b>					<b>30</b>	<b>16</b>	<b>125</b>	<b>375</b>	<b>500</b>
II	18U2LT02	I	Languages	Tamil or anyone Language – II	5	3	25	75	100
	18U2LE02	II	Languages	Communicative English II	5	3	25	75	100
	18U2ZOC02	III	Core II	Chordata	6	5	25	75	100
	18U2ZOC01	III	Core Practical I	Invertebrata & Chordata	3	4	40	60	100
	18U2BOA02	III	Allied Paper	Allied Botany Theory-II	4	3	25	75	100
	18U2BOAP01	III	Allied Practical -I	Allied Botany Practical	3	3	40	60	100
	18U2ES01	IV	-	Environmental Studies	2	2	25	75	100
			Library		1	-	-	-	-
			Sports		1	-	-	-	-
<b>Total</b>					<b>30</b>	<b>23</b>	<b>205</b>	<b>495</b>	<b>700</b>
III	18U3LT03	I	Languages	Tamil or anyone Language – III	6	3	25	75	100
	18U3LE03	II	Languages	Communicative English III	6	3	25	75	100
	18U3ZOC03	III	Core III	Cell Biology	4	5	25	75	100
	18U4ZOC02	III	Core Practical- II	Cell Biology & Genetics	3	-	-	-	-
	18U3CHA01	III	Allied Paper	Allied Chemistry Theory -I	4	3	25	75	100
	18U4CHAP01	III	Allied Practical	Allied Chemistry Practical	3	-	-	-	-
	18U3ZOS01	IV	SBEC-I	Ornamental Fisheries	2	2	25	75	100
--	IV	NMEC- I	Selected by students	2	2	25	75	100	
<b>Total</b>					<b>30</b>	<b>18</b>	<b>150</b>	<b>450</b>	<b>600</b>
IV	18U4LT04	I	Languages	Tamil or anyone Language – IV	6	3	25	75	100
	18U4LE04	II	Languages	Communicative English IV	6	3	25	75	100
	18U4ZOC04	III	Core IV	Genetics	4	5	25	75	100
	18U4ZOC02	III	Core Practical II	Cell Biology & Genetics	3	4	40	60	100
	18U4CHA02	III	Allied Paper	Allied Chemistry Theory -II	4	3	25	75	100
	18U4CHAP01	III	Allied Practical	Allied Chemistry Practical	3	3	40	60	100
	18U4ZOS02	IV	SBEC-II	Agriculture Entomology	2	2	25	75	100
--	IV	NMEC-II	Selected by Students	2	2	25	75	100	
<b>8Total</b>					<b>30</b>	<b>25</b>	<b>230</b>	<b>570</b>	<b>800</b>
V	18U5ZOC05	III	Core V	Animal Physiology	5	5	25	75	100
	18U5ZOC06	III	Core VI	Developmental Biology	5	5	25	75	100
	18U5ZOC07	III	Core VII	Microbiology	5	5	25	75	100
	18U6ZOC03	III	Core Practical-III	Animal Physiology, Developmental Biology and Microbiology	3	-	-	-	-
	18U6ZOC04	III	Core Practical-IV	Evolution and Ecology	3	-	-	-	-
	18U5ZOE01	III	Elective-I	Biotechnology	5	5	25	75	100
	18U5ZOS03	IV	SBEC-III	Sericulture	2	2	25	75	100
18U5ZOS04	IV	SBEC-IV	Vermi Technology	2	2	25	75	100	
<b>Total</b>					<b>30</b>	<b>24</b>	<b>150</b>	<b>450</b>	<b>600</b>
VI	18U6ZOC08	III	Core Course VIII	Evolution	5	5	25	75	100
	18U6ZOC09	III	Core Course IX	Ecology	5	5	25	75	100
	18U6ZOC03	III	Core Practical-III	Animal Physiology, Developmental Biology and Microbiology	3	5	40	60	100
	18U6ZOC04	III	Core Practical-IV	Evolution and Ecology	3	4	40	60	100
	18U6ZOE02	III	Elective-II	Biochemistry	4	5	25	75	100
	18U6ZOE03	III	Elective-III	Medical Laboratory Techniques	4	4	25	75	100
	18U6ZOS05	V	SBEC-V	Poultry Science	2	2	25	75	100
	18U6ZOS06	IV	SBEC-VI	Aquaculture	2	2	25	75	100
18U6EX01	V	Extension Activities		-	1	-	-	-	
			Library/Sports		1	-	-	-	
			Group Project		1	1			
<b>Total</b>					<b>30</b>	<b>34</b>	<b>230</b>	<b>570</b>	<b>800</b>

**Semester- I**  
**Core Paper- I**  
**Code: 18U1ZOC01**

**Hrs/Week: 6**  
**Credits: 5**

## **INVERTEBRATA**

### **COURSE OBJECTIVE**

- To understand the level of organization in animal kingdom from unicellular organism to multi-cellular organism
- To learn structural variations and functional aspects based on their evolutionary advancement
- To identify beneficial and harmful invertebrates in the biosphere
- The students are able to understand the classification and characteristics of different classes of invertebrates.

### **COURSE OUTCOME**

- ✓ Deep knowledge in animal kingdom
- ✓ Student have the knowledge on variety of invertebrate in them area and surroundings
- ✓ The students are understand and maintenance of invertebrate species
- ✓ Evolutionary innovation in invertebrate group
- ✓ The students are understanding morphological and behavior of invertebrate
- ✓ The students are understood how organisms interact with their environments and their adaptive mechanisms.

### **UNIT: I (15 Hours)**

A brief introduction and Nomenclature – Level of organization in Animal Kingdom (Linnaeus). *Phylum: Protozoa*: General characters – Classification (up to order) – Type study – **Paramecium** – Structure and Reproduction. General topic – Protozoan disease and their control measures in Human.

### **UNIT: II (15 Hours)**

*Phylum: Porifera*: General characters –Classification (up to order) –Type Study– **Ascon** – Cellular structure. *Phylum: Coelenterata (Cnidaria)* – Classification (up to order) – Type Study - **Aurelia** – Structure and life history. General Topics Canal System in Sponges – polymorphism in Coelenterates.

### **UNIT: III (20 Hours)**

*Phylum: Platyhelminthes* – General characters – Classification (up to order) – Type study –Liver fluke- Structure, Life cycle and Reproduction.

*Phylum: Annelida* – General Characters - Classification (up to order) – Type study – **Nereis** – External morphology and Reproduction. General Topics: Helminth Parasites of Man. Nematode parasites of man and animals.

### **UNIT: IV (15 Hours)**

*Phylum: Arthropoda* – General characters - Classification (up to order) – Type study – Cockroach – External morphology and Reproductive System. Larval forms of Crustaceans.

*Phylum:* Mollusca: General characters – Classification (up to order) - Type Study – **Pila** - Nervous system, External morphology, digestive system and reproductive system. General Topic: “Economic Importance of Mollusca”.

**UNIT: V (15 Hours)**

*Phylum:* Echinodermata: General characters – Classification (up to order) – Type – **Asterias rubens** (starfish) – External morphology water vascular system in star fish. General Topic: Larval forms of Echinoderms.

**TEXT BOOK:**

1. N.C. Nair, S. Leelavathy, N. Soundarapandian, T. Murugan, N. Arumugam (2004) A Text Book of Invertebrates (Saras Publication) Nagercoil.
2. Kotpal R.L. (2003) Modern Text Book of Zoology – Invertebrates, Rostogi Publication, Meerut

**REFERENCE BOOKS:**

1. Agarwal V.K. (2000) Invertebrate Zoology – S. Chand and Company Ltd., publications, New Delhi.
2. Barnes R.D. (1987) Invertebrate Zoology – Saunders College publications.
3. Barrington E.J.W., (1981) Invertebrate structure and function – ELBS edition.
4. Ekambaranatha Iyer (1993) Manual of Zoology – Vol. I. Invertebrata. S. Viswanathan (Printers & Publisher) Chennai.

## B.Sc. ZOOLOGY

Semester- II

Core Paper- II

Code: 18U2ZOC02

Hrs/Week: 6

Credits: 5

### CHORDATA

#### Objective:

- To learn the animal organ system and its functional variations from prochordata to higher vertebrate
- To understand the knowledge about, adaptation of Physiological, Biochemical and Genetically modification

#### OUTCOME

- ✓ *The students have good understanding with general principles of vertebrate classification & phylogeny and characteristics of the major chordate taxa.*
- ✓ *The students appreciate the basic concepts of Chordate diversity*
- ✓ *Students acquire knowledge about various habits and adaptive radiations of vertebrates*

#### UNIT: I (20 Hours)

Introduction - Type study: **Amphioxus** - External Characters, Digestive, Excretory, Respiratory and Circulatory systems.

Class: Pisces, General Characters - Type study: **Scoliodon** – External Characters, Digestive, Excretory, Respiratory and Circulatory systems – Structure of Brain - Sense organs Reproductive System. General Topic: Accessory respiratory organs in fishes.

#### UNIT: II (20 Hours)

Class: Amphibia: General Characters - Type Study: **Frog** – External Characters - Digestive, Respiratory, Circulatory and Reproductive systems -Structure of brain.

Class: Reptilia: General Characters - Type Study: **Calotes** – External characters - Digestive, Respiratory, Circulatory and Reproductive System - Structure of Brain.

General Topic: 1) Parental care of Amphibian. 2) Identification of poisonous and non-poisonous snakes.

#### UNIT: III (10 Hours)

Class: Aves - General Characters - Type Study **Pigeon** – External Characters - Digestive, Respiratory, Circulatory and Reproductive system - Structure of Brain.

General Topic (1) Flight adaptations in Birds. (2) Migration in Birds.

#### UNIT: IV (15 Hours)

Class: Mammalia - General Characters - Type Study. **Rabbit** – External Characters - Digestive, Respiratory, Circulatory, Excretory and Reproductive systems - Structure of Brain.

General Topic (1) Dentition in Mammals (2) Aquatic Mammals.

#### UNIT: V (10 Hours)

Comparative Study of Organ systems in vertebrates (Digestive, Respiratory, Circulatory, Excretory and Reproductive systems) - Comparative Study of Fore and Hind limbs of Vertebrates.

**TEXT BOOK:**

1. N. Arumugam (1987) A Text Book of Chordates (Saras Publication), Nagercoil.
2. Jordan, E.L & Verma, P.S. (2003) Chordate Zoology, S. Chand & Co, New Delhi.

**REFERENCE BOOKS:**

1. Ekambaranatha Iyer (1993) Manual of Zoology Vol. II, Viswanathan (Printers & Publishers), Chennai.
2. Chaki, K.K. Kundu, G. & Sarkar, S. (2005). Introduction to General Zoology. Vol. 1. New Central Book Agency (P) Ltd. Kolkata.
3. Kardong, K. V. (2002). Vertebrates: Comparative anatomy, function evolution. Tata McGraw Hill.
4. Hildebrand, M. (1995). Analysis of Vertebrate Structure. John Wiley & Sons.
5. Kent, G. C. & Carr, R. K. (2001). Comparative anatomy of the Vertebrates. 9th Ed. Mc Graw Hill.

**INVERTEBRATA & CHORDATA PRACTICALS**

**Objective:**

- To enhance their practical oriented subject knowledge, major practical, minor practical and spotters
- To compare the organ grade organization of invertebrate and chordate organisms
- To study the functional aspects of every organ in selective organisms

**OUTCOME**

The students develop neat drawing and writing skills

They gain practical knowledge about different types of animals through laboratory work

This will help the students in their carrier as laboratory technicians

**I. Major Practicals: (20 Marks)**

1. Cockroach – Nervous system (Voucher Specimen)
2. Cockroach – Digestive system (Voucher Specimen)
3. Frog – Digestive system and circulatory system. (Voucher Specimen)

**II. Minor Practicals: (10 Marks)**

5. Earthworm body setae
6. Different types of mouth parts in Insect
7. Frog – Brain Mounting. (Voucher Specimen)

**III. Spotters: (20 Marks)**

8. Classify Giving Reasons: Amoeba, Paramecium, Aurelia, Chaetopterus, Halothuria, Amphioxus, Salpa, Bufo, Limulus and Viper.
9. Drawing of Labelled Sketches: Fasciola, T.S. of Fasciol, Ephyra larva, quill feather, pigeon-pectoral girdle, pelvic girdle.
10. Biological significance of the following: Sponge Gemmule, Physalia, Leech, Bipinnaria Larva, Ichthyophis, Ascidian tadpole.
11. Relating structure and function of the following: Spicules (Sponges), Starfish – tube feet, Antennule of prawn, pristin, Echinis, Bat and Cobra.
12. Comment on Respiratory / Skeletal structure / dentition of the following: Starfish, Synsacrum, Dentition of rabbit and Dog.

**IV. Record (10 Marks)**

## B.Sc. BOTANY

Semester- I  
Allied Paper- I  
Code: 18U1ZOA01

Hrs/Week: 4  
Credits: 3

### INVERTEBRATE AND CHORDATE ZOOLOGY

#### Objective:

- To observe and study the unicellular organisms to Echinodermata
- To study about the different types of mode of action in reproduction, Locomotion, Nervous system, Sensory organ so on
- To identify the organisms which are harmful to human being and other mutually benefited organisms.

#### OUTCOME

- *The students understand the classification of animals.*
- *The students gain knowledge about invertebrates, their behavior and their diversity*
- *The students have good understanding with classification and characteristics of the major chordate taxa.*

#### UNIT: I (10 Hours)

Outline classification of Animal kingdom

**Protozoa:** External Morphology of Paramecium –Conjugation.

**Porifera:** Cellular Structure of Leucosolina.

**Coelenterata:** External morphology of Aurelia and its life history

General Topic: Protozoan and human disease

#### UNIT: II (8 Hours)

**Platyhelminthes:** External structure of *Fasciola hepatica* and excretory system

**Annelida:** Earthworm – Digestive system and excretion.

General Topic: Human Helminth Parasite.

#### UNIT: III (12 Hours)

**Arthropoda:** External Morphology of Penaeus

**Mollusca:** External Structure of Fresh water mussel and Digestive system.

**Echinodermata:** Star fish – External structure

General Topic: Water vascular system.

#### UNIT: IV (10 Hours)

**Chordata: Hemichordata:** External Morphology of Amphioxus and Digestive system.

**Pisces:** External morphology of ‘Shark’ – Digestive system of shark.

**Amphibia:** Frog- External Structure and Respiratory system.

General Topic: Parental care in Amphibia.

**Reptilia:** Identification of poisonous and Non poisonous snakes.

#### UNIT V (10 Hours)

**Aves:** Pigeon – Digestive System and Respiratory System.

General Topic: Flight adaptation in birds

**Mammalia:** Rabbit – Digestive system and Structure of Brain.

**REFERENCE BOOKS:**

1. Agarwal V.K. (2000) Invertebrate Zoology – S.Chand and Company Ltd., publications, New Delhi.
2. Ekambaranatha Iyer (1993) Manual of Zoology –Vol. I &II Invertebrata, S. Viswanathan (Printers & Publisher) Chennai.
3. Kotpal R.L. (2003) Modern text book of Zoology – Invertebrates, Rostogi publication, Meerut
4. Jordan, E.L & Verma, P.S. (2000) Chordate Zoology, S. Chand & Co, New Delhi.

## B.Sc. BOTANY

Semester- II  
Allied Paper- II  
Code: 18U2ZOA02

Hrs/Week: 4  
Credits: 3

### ALLIED ZOOLOGY

#### Objective:

- To acquire knowledge about zoology in relation to cell biology, developmental biology, physiology ecology and evolution
- To understand the functional variation about and evolutionary modifications

#### OUTCOME

- ✓ *The students familiar with cell structure and function understanding the metabolic processes of cells in terms of cellular organelles and biological molecules.*
- ✓ *Students enhance an in-depth knowledge on embryonic development.*
- ✓ *Students appreciate the relationships between ecology and society.*

#### UNIT: I (10 Hours)

**Cell Biology:** Structure of Animal Cell - Structure and function of Plasma Membrane and Mitochondria. Significance of Mitosis and Meiosis.

**Genetics:** Mendelian Laws of Inheritance.

#### UNIT: II (12 Hours)

**Developmental Biology:** Gamatogenesis - Fertilization and Cleavage. Blastulation and Gastrulation in Frog.

#### UNIT: III (8 Hours)

**Physiology:** Digestion and Excretion in man.

#### UNIT: IV (10 Hours)

**Ecology:** Pond Ecosystem - Animal Associations - Pollution (Air, Water & Noise)

#### UNIT V (10 Hours)

**Evolution:** Geological time scale, Lamarkism and Neo-Lamarkism, Darwinism and Neo-Darwinism

#### TEXT BOOKS:

1. Bernice Anantharaj - Allied Zoology
2. De Robertis EDP and De Robertis EMF. (1996) Cell & Molecular Biology. BI Wauerly Pvt. Ltd, New Delhi.
3. Verma P.S. and Agarwal V.K. – Concepts of Genetics
4. Richard W. Hill, Gordon A. Wyse (2004) Animal Physiology, Second Edition, Sinauer Associate, Inc Publishers, USA.
5. Lewis Wolpert (2007) Principles of Development (III edition) Oxford University Press, UK.
6. Verma, P.S. and Agarwal, V.L. (2005) Concepts of Evolution S. Chand & Company, New Delhi.

## B.Sc. BOTANY

Semester-I & II  
Allied Practical- I  
Code: 18U2ZOAP01

Hrs/Week: 3  
Credits: 3

### ALLIED ZOOLOGY PRACTICAL

#### Objective:

- To understand the fundamental physiology of invertebrate and chordate and their adaptations through practical
- To learn the animal association and its biological significance  
The students develop neat drawing and writing skills

#### OUTCOME

They gain practical knowledge about different types of animals through laboratory work  
This will help the students in their carrier as laboratory technicians

#### I. Major Practicals: (20 Marks)

1. Cockroach – Digestive (Voucher Specimen)
2. Cockroach – Nervous system (Voucher Specimen)
3. Frog – Digestive system (Voucher Specimen)
4. Prawn – Appendages

#### II. Minor Dissection and Mounting: (10 Marks)

5. Earth worm - Body setae
6. Honey bee - Mouth parts
7. Mosquito - Mouth parts
8. Frog - Brain Mounting (Diagramatic presentation only)

#### III. Spotters: (20 Marks)

##### 9. Comment on

Amoeba, paramecium, Aurelia, Fasciola hepatica, Ephyra larva, *Taenia solium*, *Fasciola hepatica*. C.S., Ascaris – Male & Female, Amphioxus, Shark, Ichthyophis, Cobra, Sea anemon on hermit crab, pigeon, Blastula of frog, 24 hours of chick embryo, 48 hours of chick embryo, star fish, Redia / Cercaria, Nauplius, Mysis Larva.

#### IV. Submission of Record (10 Marks)

## B.Sc. ZOOLOGY

Semester- III  
Core Paper- III  
Code: 18U3ZOC03

Hrs/Week: 4  
Credits: 5

### CELL BIOLOGY

#### Objective:

- To learn the structural organization of animal cell
- To acquire knowledge about cell components and their functions
- To know the instruments for cytological studies and their principles

#### UNIT: I (12 Hours)

**Introduction** - Cell, Discovery of cell, Structure and functions of animal cell, **Plasma membrane** - Ultra structure – Models of plasma membrane - Chemical composition and functions. **Endoplasmic reticulum** - Morphology, Ultra structure, Chemical composition and functions. **Golgi Complex** - Ultra Structure, Chemical composition and functions.

#### UNIT: II (12 Hours)

**Lysosomes:** Introduction - Ultra Structure and types of lysosome - Chemical composition and functions: **Structure and functions of micro bodies** - Peroxisomes and Glyoxysomes. **Mitochondria:** Ultra Structure – Chemical composition – functions – Oxidation – Respiratory chain (ETP) – Kreb's cycle, ATP production.

#### UNIT: III (12 Hours)

**Ribosomes:** Ultra structure - types-chemical composition - functions. **Nucleus:** Ultra structure of Nucleus and functions. **Nucleic Acids:** DNA - Ultra Structure - replication - transcription, RNA - types- Genetic code - Protein synthesis.

#### UNIT: IV (12 Hours)

**Chromosomes** - Ultra Structure of Chromosomes and Giant Chromosomes **Cell Divisions:** Mitosis, Meiosis and Significance and Salient features of Cell Cycle. **Cancer biology:** Types of Cancer, Oncogenes.

#### UNIT: V (12 Hours)

**Cell Biology techniques:** Principles and Applications of Phase contrast microscope. Cell fractionation - Isolation of sub cellular components - Fixation - Fixative and staining, **Biochemical techniques** – Chromatography - Electrophoresis and their application.

#### TEXT BOOKS:

1. Cell Biology, Veer Bala Rostogi, Rostogi Publications, Meerut.

#### REFERENCE BOOKS:

1. De Robertis EDP and De Robertis EMF. (1996) Cell & Molecular Biology. BI Wauerly Pvt. Ltd, New Delhi.
2. Karp, G.Cell (1996) Molecular Biology- Concept and Experiments, Jhon Wiley & Sons Inc, New York.

## B.Sc. ZOOLOGY

Semester- III  
SBEC- I  
Code: 18U3ZOSO1

Hrs/Week: 2  
Credits: 2

### ORNAMENTAL FISHERIES

#### Objective:

- To enhance the fundamental knowledge for new entrepreneur in this field
- To ensure the modification of academic based knowledge towards entrepreneurship
- To promote the emerging of new entrepreneurs in women community

#### UNIT I: (6 Hours)

Importance and scope of ornamental fish culture, current trends in ornamental fish farming in India and worldwide.

Construction of Home aquarium: size, shape, substrate. Aerators and filters - Hand net and other equipment. Water quality requirements- Temperature control and lighting.

#### UNIT II: (6 Hours)

Setting up of tanks – gravel/ pebble – plants – ornamental objects – Selection of species – Introducing fishes to the aquarium.

#### UNIT III: (6 Hours)

Species of ornamental fishes – taxonomy and morphology of gold fish, guppies, swordtail. Marine fishes – Angel and butterfly fishes. Live bearers and egg layers – Freshwater and marine water fishes with examples. Other ornamental organisms – Anemones, Lobsters, Shrimps, Octopus, Star fish etc.

#### UNIT IV: (6 Hours)

Nutritional requirements of aquarium fishes – Live feed and artificial feeds. Transport in fishes – oxygen packing, Anesthetics used in fish transport, mechanism of action. Preparing of fishes.

#### UNIT V: (6 Hours)

Disease management: Common bacterial, viral, fungal, protozoan and crustacean infections and their control methods. Marketing strategies.

#### REFERENCE BOOKS:

1. Jhingran, V.G. (1982) Fish and Fisheries in India. Hindustan Publishing Corporation, New Delhi.
2. Jameson, J.D and Santhanam. R. (1996). Manual of ornamental fishes and farming technologies. Tamilnadu Veterinary and Animal Science University, Tuticorin.

## B.Sc. BOTANY

Semester- III  
NMEC- I  
Code: 18U3ZON01

Hrs/Week: 2  
Credits: 2

### SERICULTURE

#### Objectives:

- To develop the women entrepreneurship through the sericulture
- To understand methods cultivation process of mulberry leaf

#### UNIT: I (6 Hours)

**GENERAL ASPECTS OF SILKWORMS:** History of Sericulture, Sericulture in India Future scopes. Types of silk - mulberry, tasar, muga, eri. Morphology and life cycle of silkworms. Uses of silkworm.

#### UNIT: II (6 Hours)

**MULBERRY CULTIVATION:** Moriculture, Morphology of mulberry plant, Selection of land and cultivation of mulberry, Mulberry varieties, Different methods of planting, Organic and Inorganic manure application, Pruning – Objectives.

#### UNIT: III (6 Hours)

**SILKWORM REARING:** Rearing houses and appliances, Pest and diseases of silkworm and preventive measures, Egg transportation and incubation – Egg handling – Hatching – Brushing – Silkworm rearing techniques. Feeding according to the stages- Harvesting of cocoon and cocoon assessment.

#### UNIT: IV (6 Hours)

**GRAINAGE TECHNIQUES:** Egg production – Hibernation Acid treatment of hibernating eggs – Loose egg production – Materials required for grainage techniques.

#### UNIT V: (6 Hours)

**SILK REELING:** Reeling methods – Re-reeling – Silk examination, cleaning, lacing, skeining , book making – grading of silk- Marketing.

Field visit to silkworm rearing place & reeling industry.

#### TEXT BOOKS:

1. An Introduction to Sericulture (IInd edition) G. Ganga & Sulochana chetty.
2. Rangaswamy .G. (1987).Manual on sericulture FAO, Vol I-IV, Agriculture service Bulletin, CSB, Bangalore , India.

#### REFERENCE BOOKS:

1. Dandin .S.B (2004), Handbook of new sericulture technologies, Central Silk Board, Bangalore, pp287.

## B.Sc. ZOOLOGY

Semester- IV  
Core Paper- IV  
Code: 18U4ZOC04

Hrs/Week: 4  
Credits: 5

### GENETICS

#### Objective:

- To learn the gene and its characteristics like expression, dominance and recessive

#### UNIT I: (12 Hours)

Introduction – Laws of Mendel- Monohybrid and Dihybrid Experiment. – Interaction of Genes (Epistatic gene, Complementary gene, & Lethal genes).

#### UNIT II: (12 Hours)

Mechanism of Linkage and crossing over – Types and theories –Significance of crossing over-. Chromosomal mapping, Multiple alleles. Inheritance of Blood group in man and coat colour in Rabbit. Sex linked Inheritance (Haemophilia, colourblindness).

#### UNIT III: (12 Hours)

Sex determination in man, Drosophila and Bonellia – Mutations – Types of mutation and chromosomal aberrations and mutagens.

#### UNIT IV: (12 Hours)

Inbreeding and out breeding, heterosis- Hybrid Vigour – Genetic application in animals – DNA as genetic material – experiments – Human karyotype preparation and chromosomal syndrome in man (Down's syndrome, Turner's syndrome and Klinefelter's syndrome).

#### UNIT V: (12 Hours)

Haemoglobin disorders - Sickle cell anemia and thalassemia, Gene metabolic pathways, Inborn errors of metabolism in man. Eugenics- Genetic Engineering: Scope and applications

#### TEXT BOOKS:

1. Verma P.S. and Agarwal V.K. – Concepts of Genetics.
2. Rastogi V.B. A text book of Genetics, Kadarnath, Ramnath, Meerat.
3. Sambamurthy. AVSS - Genetics – Narosa Pub. House, New Delhi.
4. Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M and Losick, R., (2004) "Molecular Biology of the gene' Pearson education, Singapore Pvt., Ltd.,

## B.Sc. BOTANY

Semester- IV  
NMEC- II  
Code: 18U4ZON02

Hrs/Week: 2  
Credits: 2

### APICULTURE

#### Objective:

- To learn about honey bee culture
- To know the handling of honey hives and bees
- To fulfill the employment opportunities in apiary

#### UNIT I: (6 Hours)

Honeybee – systematic position with reasons – species of Honeybees- Apiculture in India – Life history of Honeybee – Social behaviour – swarming – pheromone.

#### UNIT II: (6 Hours)

Bee colony – castes – natural colonies and their yield – Types of bee hives – structure – location.

#### UNIT III: (6 Hours)

Apiary – Care and Management – Artificial bee hives – types – Instruments employed in Apiary – Extraction instruments.

#### UNIT IV: (6 Hours)

Honey – Composition and quality assessment – uses – Bee wax and its uses – Production in national and international market – Diseases of honey bees and their control methods.

#### UNIT V: (6 Hours)

Apiculture as self – employment venture preparing proposals for financial assistance and funding agencies – Economics of bee culture.

#### REFERENCE BOOKS:

1. Cherian R, & K.R. Ramanathan, 1992 – Bee keeping in India,
2. Mishra, R.C., 1985 – Honey bees and their Management in India, ICAR.
3. Singh, S.1982-Bee keeping – ICAR
4. Sharma, P. and Singh L. 1987 – Hand book of bee keeping, Chandigarh
5. Rare, S. 1998-Introduction. to bee keeping, Vikas publishing house.

## B.Sc. ZOOLOGY

Semester- IV  
SBEC-II  
Code: 18U4ZOS02

Hrs/Week: 2  
Credits: 2

### AGRICULTURE ENTOMOLOGY

#### Objective:

- To enrich the agricultural entomology knowledge to promote the agriculture
- Disease identification and control measures by means of IPM and biological methods

#### UNIT I: (6 Hours)

Introduction and classification of insect. Scope of agricultural Entomology-and its importance, Pest control measures- Mechanical, Cultural, Physical, Chemical and Biological methods. IPM

#### UNIT II: (6 Hours)

Pest of crop - Rice stem borer- Systematic Position - Biology of the pest, Control measures. Gram and pod borer- Systematic Position - Biology of the pest, Control measures.

#### UNIT III: (6 Hours)

Pest of sugarcane - Stem borer in sugarcane- Systematic Position - Biology of the pest, Control measures. Spotted bollworm in cotton- Systematic Position - Biology of the pest, Control measures.

#### UNIT IV: (6 Hours)

Pest of oil seeds - Groundnut-Aphids- Systematic Position - Biology of the pest, Control measures. Gingelly- shoot borer and fruit borer- Systematic Position - Biology of the pest, Control measures.

#### UNIT V: (6 Hours)

Pest of stored products - Grannery weevil, Pulse beetle- Systematic Position - Biology of the pest, Control measures

#### REFERENCE BOOKS:

1. Vasantharaj David.B and Kumaraswami. T (1988) Elements of Economic Entomology.
2. Mani.M.S (1982) General Entomology, Oxford and IBH publishing Co.
3. Awasthi.V.B (2002) Introduction to general and applied Entomology, Scientific publishers (India) Jodhpur.
4. Nalinasunthari and R. Santhi (2006) Entomology, MJP publishers Chennai.

## B.Sc. ZOOLOGY

Semester- IV  
Core Practical - II  
Code: 18U4ZOP02

Hrs/Week: 3  
Credits: 4

### CELLBIOLOGY AND GENETICS

#### Objectives:

- To learn the cytological techniques
- To know the mutation and its variation
- To assess the beneficial and harmful mutations

#### A. CELL BIOLOGY PRACTICALS (20 Marks)

1. Counting of RBC and / WBC Using haemocytometer
2. Differential count of WBC
3. Mounting Buccal Epithelium and observing living Cells using vital staining
4. Study of mitotic division using onion root tips

#### B. GENETICS PRACTICALS (10 Marks)

1. Observation of common mutants of *Drosophila*
2. Preparation of mounting of the salivary gland in chironomous larva/ *Drosophila* larva
3. Human blood grouping.

#### C. SPOTTERS (20 Marks)

1. Care & Use of Microscopes
2. Camera Lucida
3. Stage and Ocular micrometers
4. Haemocytometer
5. *Chironomous* larva
6. *Drosophila* – Wings and Eye.
7. Electrophoresis Kit
8. Stages of Mitosis.

#### D. SUBMISSION OF PRACTICAL RECORDS. (10 Marks)

## B.Sc. ZOOLOGY

Semester- V  
Core Paper- V  
Code: 18U5ZOC05

Hrs/Week: 5  
Credits: 5

### ANIMAL PHYSIOLOGY

#### Objective:

- To understand the metabolic process of biomolecules
- To gain more knowledge about the functional aspects of different systems in animals

#### UNIT: I

Digestion: Digestion of carbohydrates, proteins & lipids and absorption. Metabolism: Carbohydrate, lipid metabolism – Beta oxidations – ketosis; Protein metabolism – deamination – transamination.

#### UNIT: II

Respiration in man: Respiratory tract – Structure of hemoglobin – Transport of respiratory gases – Oxygen disassociation curve – Carbon-di-oxide transport – Chloral shift - Hb as a buffer. Circulation: Composition of blood – Blood clotting – Heart beat – origin – conduction – Cardiac cycle – Blood pressure, ECG.

#### UNIT: III

Muscle contraction: Types of muscles, Ultra structure of Skeletal Muscle, Theories of Muscle contraction, Muscle Proteins - Neurons – Structure and types. Neural conduction: Resting potential – conduction of nerve impulse – synaptic transmission – neuromuscular junction – reflexes. Sense organs – Eye and Ear.

#### UNIT: IV

Osmoregulation – ionic regulation of fresh water fish; Thermoregulation – regulation of body temperature in animal. Endocrine glands: Structure and functions of Adrenal Glands, Hypothalamus, Ovaries, Pancreas, Parathyroid, Pineal Gland, Pituitary Gland, Testes, Thymus, Thyroid and Islets of langerhans.

#### UNIT: V

Excretion: Nephron – Structure and Function, Formation of urine. Nitrogenous waste products – ammonia - urea – uric acid. Reproduction: Anatomy of reproductive organs in human – reproductive cycles – hormone control of reproduction.

#### Text book:

1. Singh, H. R. (2006) Animal Physiology and Related biochemistry. S. Chand & Co., Publishers, New Delhi.
2. Berry, A.K. (2004) A text book of Animal physiology, Jagdamba offset press, New Delhi.

#### REFERENCE BOOKS:

1. Moyes, C.D. and Schulte, P. M. (2006) Principles of Animal Physiology, Pearson Education Inc., Chennai.
2. Tortora, G. J. and Derrickson, B. (2006) Principles of Anatomy and Physiology, 11th edition, John Wiley and Sons Inc., USA.
3. Richard W. Hill, Gordon A. Wyse (2004) Animal Physiology, Second Edition, Sinauer Associate, Inc Publishers, USA.
4. Guyton, A.C. (2001) Text book of Medical Physiology, 10th edition W. B. Saunders Company, Philadelphia.

## B.Sc. ZOOLOGY

Semester- V  
Core Paper- VI  
Code: 18U5ZOC06

Hrs/Week: 5  
Credits: 5

### DEVELOPMENTAL BIOLOGY

#### Objective:

- To learn about the cyclic process of gametes, Placenta and its developmental pathway
- To understand the phenomenon found in different organisms and their interrelationship

#### UNIT: I

Gametogenesis – Definition spermatogenesis sperm structure, sperm motility. Oogenesis, Ultra structural organization of the egg.

#### UNIT: II

Fertilization – Definition, Types, mechanism of fertilization – significance Parthenogenesis. Fate map (frog).

#### UNIT: III

Cleavage – Definition, salient features, types and patterns of cleavage. Blastulation – Types of Blastula. Gastrulation – Definition, patterns and physiology of gastrulation (Amphioxus and chick).

#### UNIT: IV

Placenta – Structure and types. Differentiation; Organogenesis-Development of eye, heart and brain in chick.

#### UNIT: V

Metamorphosis – Definition, Types, and Physiological changes associated with metamorphosis Hormonal control of amphibian metamorphosis – Neuro endocrine control of insect metamorphosis. Regeneration.

#### Text Books:

1. Verma, P.S. and Agarwal, V.K. (2009) Chordata Embryology, S. Chand & Company Ltd., New Delhi.
2. Arumugam, N. (2009) A Text book of Embryology (Developmental Biology), Saras Publication, Kanyakumari.
3. Khanna, D.R. (2009) Embryology, Sonali Publications, New Delhi.

#### REFERENCE BOOKS:

1. Lewis Wolpert (2007) Principles of Development (III edition) Oxford University Press, UK.
2. Gilbert, F.S. (2006) Developmental Biology, 8th edition, Sinauer Associates, Inc. Publishers, Massachusetts.
3. Balinsky, B.I. (2004) An Introduction to Embryology, 5th edition, Thomas Asia Pvt. Ltd, Chennai.
4. Gilbert, F.S. (2003) Developmental Biology, 7<sup>th</sup> Edition, Sinauer Associates, Inc. Publishers, Massachusetts.

## B.Sc. ZOOLOGY

Semester- V  
Core Paper- VII  
Code: 18U5ZOC07

Hrs/Week: 5  
Credits: 5

### MICROBIOLOGY AND IMMUNOLOGY

#### Objectives:

- To teach the students about the discrimination between propagated and the actual concept of microbes
- To aware the students through teaching about the microbial disease

#### UNIT: I INTRODUCTION AND CLASSIFICATION

Historical background- scope- Contribution of Louis Pasteur, Robert Koch, Alexander flaming- Outline classification of microbes – Whittaker's five kingdom concept – Protist, Prokaryotes, Eukaryotes. Basic structure and salient features of – Virus, Bacteria, Fungi. Gram staining: Gram negative, Positive bacteria.

#### UNIT: II MICROBES AND DISEASES

Microbial disease of man (Causative agents) Bacterial disease – Diphtheria, TB, Typhoid. Viral disease – Influenza, chicken pox, Hepatitis, AIDS. Fungal disease - [Aspergillosis](#), [Candidiasis](#)

#### UNIT: III MICROBIAL CULTURE

Disinfection – Types of sterilization. Medium preparation – Types of media; Nutritional requirements; Culture of bacteria – Methods: Types of bacterial culture, Maintenance of pure culture, Bacterial growth curve. Culture techniques – handling methods.

#### UNIT: IV IMMUNE SYSTEM:

Introduction and definition, Cells involved in the immune system, Innate immunity- factors involved in innate immunity, active and passive acquired immunity. Lymphoid System: Definition, types and their biological significance.

#### UNIT: V IMMUNOGLOBULINS

General structure and functions of different types of human immunoglobulins - IgA, IgG, IgD, IgE, and IgM. Antigen- antibodies reaction – Classical and Alternative pathways. Vaccination schedule

#### TEXT BOOKS:

1. Ananthanarayan, R., and Jayaram Paniker, C.K. (2006) Text book of Microbiology, Orient Longman Ltd., New Delhi.
2. Purohit, S.S. (2006) Microbiology, V Edition, Agrobios (India) Publishers, Jodhpur.

#### REFERENCE BOOKS:

1. Kamal, G.P. Rao and D.R. Modi (2005) Concepts of Microbiology, International Book Distributing Co., Lucknow.
2. Dubay, R. C. and Maheshwari D. K. (2005) Text Book of Microbiology, S. Chand & Co. Ltd., New Delhi.
3. Prescott, L.M., Harley, J.P. and Ulein, B.A. (2004) Microbiology (IV Edi). WMC, Broun Publisher, USA.
4. Pelczar, M.J. (2002) Microbiology, McGraw-Hill Education India Ltd., New Delhi.

## B.Sc. ZOOLOGY

Semester- V  
Elective- I  
Code: 18U5ZOE01

Hrs/Week: 5  
Credits: 5

### BIOTECHNOLOGY

#### Objectives:

- To understand the recent technologies used in natural as well as artificially to improve the quality of production
- To learn about the genetic engineering and its importance in biological field

#### UNIT: I INTRODUCTION

Biotechnology: Introduction, Definition, scope and importance –Agriculture, Animal Husbandry, environmental and medicine biotech.

#### UNIT: II GENETIC ENGINEERING

Introduction, Definition, Tools of genetic engineering, Gene cloning and Methods involved. Gene library and Gene bank. Transgenesis – Cow and Goat. Gene transfer methods; Electroporation and gene gun method. PCR- Mechanism, variation and applications.

#### UNIT: III Animal Cell culture:

Requirements: Infrastructure, Equipments, Media. Sterilization and culture techniques and its types. Preservation and storage of cells. Advantages and applications of cell culture. Safety and risks of cell culture.

#### UNIT: IV

Industrial Biotechnology: Principle of fermentation – process of fermentation, upstream and downstream processing – methods of fermentation industrially used micro organisms, Uses of micro organisms in agriculture, Nitrogen fixation, Microorganisms as source of food.

#### UNIT: V

Enzyme Biotechnology: Enzyme - source – production in large scale – Extraction of enzyme, Purification of enzyme – immobilization of enzyme and advantages – Applications of enzymes. Outline of stem cells – types – generation of adult stem cells and its applications.

#### TEXT BOOKS:

1. Satyanarayana, U. (2010) Biotechnology, Books and Allied (P) Limited, Kolkata.
2. Dubey, R.C. (2009) Text Book of Biotechnology. S. Chand and Company Ltd, New Delhi.

#### REFERENCES BOOKS:

1. Kumar, H.D. (2008) Modern concepts of Biotechnology, Vikas Publishing House Pvt Ltd., New Delhi.
2. Sasidhara, R. (2006) Animal Biotechnology, MJP Publishers, Chennai.
3. Dubey, R.C. (2006) A textbook of Biotechnology, S. Chand Company Ltd, New Delhi.
4. Pradeep Parihar, (2004) A textbook of Biotechnology, Student Edition, Jodhpur.
5. Ranga, M.M. (2003) Animal Biotechnology, Agrobios Publishers, India,
6. Primrose, S.B. (2000) Modern Biotechnology, Blackwell Scientific Publication, Oxford, London.

## B.Sc. ZOOLOGY

Semester- V  
SBEC- III  
Code: 18U5ZOS03

Hrs/Week: 2  
Credits: 2

### SERICULTURE

#### Objectives:

- To develop the women entrepreneurship through the sericulture
- To understand methods cultivation process of mulberry leaf

#### UNIT: I

Scope of sericulture; History of sericulture; Development of sericulture in India – Economic Importance.

#### UNIT: II

Moriculture: Mulberry varieties in Tamil Nadu; Methods of propagation, Suitable soil, irrigation, manuring, application of fertilizers. Pruning – mulching – Harvesting of leaves – preservation of leave. Disease and pests of mulberry.

#### UNIT: III

Races of silk worm ,Life cycle of *Bombyx mori* – Rearing house – Rearing appliances – Rearing methods; Seed production – rearing of young age silk worm – Rearing of late age of silkworm.

#### UNIT: IV

Disease and pests of silk worm – prevention and control measures; Mounting of silkworm for spinning cocoons; Harvesting and marketing of cocoons; Quality of cocoons.

#### UNIT: V

Reeling of Cocoons – process of reeling – stifling and storage – sorting and deflossing. Reeling equipments, Field visit.

#### TEXT BOOKS:

1. Ganga, G.J. and Sulochana Chetty, J. (2010) An Introduction to Sericulture, II Edition, Oxford & IBH Publishing & Co Pvt. Ltd., London.
2. Dandin, S.B. (2004) Hand Book of New sericulture technologies, Central Silk Board, Bangalore.
3. Srinivas, P. and Madan Mohan (2001) Mulberry cultivation, SIVE, DIE, Hyderabad.

#### REFERENCE BOOKS:

1. Prakash Malhotra (2008) Economic Zoology, Adhyayna Publishers & Distributors, New Delhi.
2. Patnaik, R.K. (2008) A Text Book of Mulberry Cultivation, Biotech Book Publishers, New Delhi.
3. Jabde and Pradip, V. (2005) Text Book of Applied Zoology, Discovery Publishing House, New Delhi.
4. Arumugam, N., Murugan, S., Johnson Rajeshwar, J, and Ram Prabhu, R. (2005) Applied Zoology, Saras Publication, Kanyakumari.

## B.Sc. ZOOLOGY

Semester- V  
SBEC- IV  
Code: 18U5ZOS04

Hrs/Week: 2  
Credits: 2

### VERMI TECHNOLOGY

#### Objective:

- To understand the usage of natural fertilizer instead of chemical fertilizer
- To learn about the preparation of vermicomposting and vermiwash

#### UNIT: I ECOLOGICAL TYPES

Trophic Classification of Earth worms – epigeic – anecic – endogeic – Drilosphere – Biological Effects of Earthworms on the soil.

#### UNIT: II STRUCTURE AND LIFE CYCLE

Morphology and digestive physiology of earthworm. Life cycle of *Lampito mauritii*, *Megacolex mauritii* (Cocoons, Juveniles, Non-Clitellates, Clitellates). Life Cycle of *Perionyx excavatus* (Cocoons, Juveniles, Non-Clitellates, Clitellates).

#### UNIT: III CULTURE TECHNIQUES

Selection of suitable species for Vermitechnology. Worms for Vermiculture, Earthworm Breeding, Role of Earthworms – In sustainable agriculture, Soil properties, Organic Farming.

#### UNIT: IV VERMICULTURE AND VERMITECH

Vermiculture – Preparation of Vermibeds, Setting up of a Vermiwash Unit – Economics of Vermitech

#### UNIT: V VERMICOMPOSTING, USES, POTENTIAL AND AGRICULTURE

Recycling of wastes through Vermicomposting; Earthworms in Medicine; Application in organic agriculture.

#### TEXT BOOKS:

1. Prakash Malhotra (2008) Economic Zoology, Adhyayna Publishers & Distributors, New Delhi.
2. NIIR Board (2006) The Complete Technology Book on Vermiculture and Vermicompost, NIIR, New Delhi.
3. Sultan Ahmed Ismail (2005) The Earthworm, Others India Press, Goa, India.

#### REFERENCE BOOKS:

1. Cliveta Edwards (2010) Vermiculture Technology, CRC Press, USA.
2. Kotpal, R.L. (2009) Modern text Book of Invertebrates: Zoology. Rajhans Publishers, New Delhi.
3. Bhattacharya, P., Kumar, D., Bihari, K. Pandey, V., Gehlot, D. and Paliwal, M.K. (2003) Vermiculture technology, National Biofertilizer Development Centre, Ghaziabad.
4. Bhatnagar, R.K. and Palta, R.K. (1996) Earthworm: Vermiculture and Vermicomposting, Kalyani Publishers, New Delhi, India.
5. Edwards, C.A. and Loft, J.R. (1977) Biology of Earthworms, 3<sup>rd</sup> Edition, Chapman Publications, London.

## B.Sc. ZOOLOGY

Semester- VI

Hrs/Week: 5

Core Paper- VIII  
Code: 18U6ZOC08

Credits: 5

### EVOLUTION

#### Objective:

- To know all the biological processes and how evolution has generated biological diversity
- To investigate the evolutionary basis of behaviour in animals, including primates and man
- To learn the origin of earth and geological time scale

#### UNIT: I

History and origin of life, Abiogenesis, Biogenesis, cosmozoic theory, Biochemical origin of life, Coacervates, and Microspheres, Theories of organic evolution, Urey and Miller,s Experiment. Types of evolution.

#### UNIT: II

Evidences - Paleontology, comparative anatomy, Embryology, Physiology & Bio Chemistry. Geological time scale.

#### UNIT: III

Lamarckism and Neo-Lamarckism – Darwinism and Neo Darwinism. Modern synthetic theory of evolution.

#### UNIT: IV

Natural selection, species & Speciation – types of speciation – Geographical and Reproductive isolation, Role of isolation in Speciation, Isolating mechanisms, Mutation and genetic drift. Evolution of horse and man. Hardy Weinberg law, prospects for the control of human evolution.

#### UNIT: V

Adaptation and Evolution – Mimicry, Colouration of animal, non- adaptive characters, Adaptive radiation in Mammals – Evolutionary significance

#### TEXT BOOKS:

1. Arumugam. N (2009) A text book of Organic Evolution, Saras Publication, Kanyakumari.
2. Rastogi, V.B. (2007) Organic Evolution, Kedarnath, Ramnath publishers, Meerut.
3. Verma, P.S. and Agarwal, V.L. (2005) Concepts of Evolution S. Chand & Company, New Delhi.

#### REFERENCE BOOKS:

1. Sanjib Chattopadhyay (2012) Life –Evolution, Adaptation & Ethology, Books and Allied (P) Ltd, KolKatta.
2. Richa Arora (2009) Patterns of Evolution, Anmol Publishers, New Delhi.
3. Richa Arora (2004) Elements of Organic Evolution, Anmol Publication Pvt. Ltd., New Delhi.
4. Rastogi, V.B. (2003) Organic Evolution, Kedarnath Ramnath Publishers, Meerut.
5. Strickberger, M.W. (2000) Evolution. Jones & Bartlett Publications, New Delhi.
6. Dodson, E.O. (1985) Evolution: Process & Product, Prindle, New Delhi.

## B.Sc. ZOOLOGY

Semester- VI  
Core Paper- IX  
Code: 18U6ZOC09

Hrs/Week: 5  
Credits: 5

## ECOLOGY

### Objective:

- To understand the biogeochemical cyclic process among the biotic and abiotic factors
- To learn about the diversity, pollution and its biological effects

### UNIT: I

Scope – Branches of Ecology – Abiotic factors – Water, Light, Temperature and Soil, Biogeochemical cycle (Carbon and Nitrogen cycle), Biotic factors – Animal relationships – Symbiosis, Commensalisms, Mutualism, Parasitism and Competition – intra specific and inter specific competition.

### UNIT: II

Ecosystem – Types, Fresh water ecosystem – Pond and Estuary ecosystem– types of Food chain – Food web – Trophic levels – Concepts of Ecological niche - Energy flow – Ecological pyramids – Pyramid of Biomass, Number and Energy. Coastal fauna – Rocky, Sandy and Muddy shore fauna and their adaptations – Adaptations of desert animals.

### UNIT: III

Population–definition–Natality, Mortality, population fluctuation, dispersal, Age pyramid, Ecological succession. Growth curve.

### UNIT: IV

Biodiversity – Types – Loss of biodiversity – threat to biodiversity – Conservation of Biodiversity. Mega diversity with reference to India.

### UNIT: V

Pollution – types (Air, Water, Soil, Radioactive, Plastic) Biological effects and control - Environmental Impact Assessment (EIA).

### TEXT BOOKS:

1. Arumugam, N. (2009) Ecology, Saras Publication, Kanyakumari.
2. Sharma, P.D. (1990) Ecology and Environment, Rastogi Publications, Meerut.

### REFERENCE BOOKS

1. Gowrikrishna Dasmohapatra (2009) Environment and Ecology (III Edn) VIKAS Publishing House Pvt Ltd, New Delhi.
2. Ahluswalia, V.K. and Sunita Malhotra (2009) Environmental Sciences, Ane Books Pvt Ltd, New Delhi.
3. Kormondy, E.J. (2007) Concepts of Ecology, Frenice Hall of India, New Delhi
4. Odum, E.P. (2003) Fundamentals of Ecology, Holt Saunders, Philadelphia.

## B.Sc. ZOOLOGY

Semester- VI  
Elective- II  
Code- 18U6ZOE02

Hrs/Week: 5  
Credits: 5

### BIOCHEMISTRY

#### Objective:

- To provide the knowledge about the biochemical change in living organisms
- To understand the structure and function of biomolecules

#### UNIT I

**Carbohydrates** - Classification, Biological importance of monosaccharide (glucose, fructose, galactose and xylose), disaccharides (sucrose and lactose), polysaccharides (glycogen, starch and chitin).

#### UNIT II

**Lipids** - Classification, structure, function and properties of simple, compound and derived lipids. Essential fatty acid and cholesterol.

#### UNIT III

**Proteins– Classification**, Essential and Non-essential amino acids. Proteins- Classification based on structure and functions. Structural organization of proteins (Primary, secondary, tertiary and quaternary structures) – Ramachandran plot.

#### UNIT IV

**Vitamins** – Classification and functions. **Nucleic Acids** – Structure, composition of purines and pyrimidines. DNA-Double helix, denaturation & renaturation. RNA – types (mRNA, tRNA, rRNA and hnRNA).

#### UNIT V

**Enzymes**- Definition, classification, active site, lock and key model, induced fit hypothesis, enzyme kinetics (MM & LB plot), factors affecting enzyme activity

#### Text Book:

1. Satyanarayana, U and Chakrapani, U (2009) Essentials of Biochemistry, Books and Allied (P) Limited, Kolkata.
2. Vasudevan, D.M and Sreekumar, S. (2003) Text Book of Biochemistry, Jaypee Brothers Medical publishers (P) Ltd, New Delhi.

#### Reference Books:

1. Satyanarayana, U (2005) f Biochemistry, Books and Allied (P) Limited, Kolkata.
2. Deb, A.C (2012) Concepts of Biochemistry, books and allied (P) Ltd. Kolkata.
3. Jain, J.L., (2005) Fundamentals of Biochemistry, S.Chand & Co Ltd.

4.Chatterjee ,M.N (2008) Text book of Medical Biochemistry by 6 th edition Jaypee brothers medical publishers (P)Ltd. New Delhi.

## **B.Sc. ZOOLOGY**

**Semester- VI**  
**Elective- III**  
**Code- 18U6ZOE03**

**Hrs/Week: 5**  
**Credits: 5**

### **MEDICAL LABORATORY TECHNIQUES**

#### **Objective:**

- To teach the method & collection of biological sample and its importance
- To make aware the students during the emergency situation
- To learn the blood sample collection and its cells counting

#### **UNIT: I**

Introduction – First aid treatments, collection of specimens and preservation - records and report preparation and maintenance –maintenance of glassware – sterilizations - Disposal of specimen – safety precautions in the laboratory –

#### **UNIT: II**

Light microscope: parts and working – Centrifuge – Colorimeter – Haemocytometer.  
Biochemical tests of cholesterol, bilirubin, protein and sugars.

#### **UNIT: III**

Blood: Collection of blood (Venous and Capillary) –Total RBC count – Total leucocytes count - differential count – Haemoglobin estimation (Sahlis methods) ESR (Wintrobe and Westgren methods) – Bleeding and clotting time – Blood grouping and cross matching (Slide and Tube methods)

#### **UNIT: IV**

Urine: Collection, preservation – Biochemical tests: protein, glucose and bile salts. Microscopic examinations. Faeces: Microscopical examination of faeces.

#### **UNIT: V**

Sputum: Collection – microscopical and naked eye inspection and clinical examination.  
Sperm: Collection of semen – microscopic examination – smear and count- Pregnancy tests: Gravindex test.

#### **TEXT BOOKS:**

1. Rajan, S. (2012) Manual for medical laboratory technology, Anjanaa Book House, Chennai.
2. Sood and Ramnik (2009) Medical Laboratory Techniques, Jaypee Brothers, New Delhi.
3. Kanai L. Mukherjee and Swarajit Ghosh (2009) Medical Laboratory Techniques, Tata Mc Graw Hill Publishing Company Ltd., New Delhi.

#### **REFERENCE BOOKS:**

1. B. S. Chauhan (2009) Principles of Biochemistry and Biophysics, first edition, Luxmi publishers, New Delhi.
2. Garrod, L.P. (2008) Medical Laboratory Techniques, BMJ publishers, USA.
3. Estridge, B.H., Reynolds, A.P. and Walters N.J. (2007) Basic Clinical Laboratory Techniques, Cengage Learning, Hyderabad.

## B.Sc. ZOOLOGY

**Semester- VI**  
**SBEC -V**  
**Code- 18U6ZOS05**

**Hrs/Week: 2**  
**Credits: 2**

### POULTRY SCIENCE

#### **Objective:**

- To explore the cultivation of poultry
- To understand the methodology of construction of poultry house
- To create the aware the students for about the poultry disease and its treatment

#### **UNIT: I**

Poultry industry in India – Poultry breeds and classes of fowls – Poultry housing – general principles of building poultry house.

#### **UNIT: II**

Rearing of fowls – growers. Layers and broilers – growth management – summer and winter management.

#### **UNIT: III**

Poultry nutrition –Composition of poultry feed – nutrient requirements for fowls – nutritional deficiency symptoms.

#### **UNIT: IV**

Poultry diseases: Ranikhet disease, New castle disease, Fowl pox, Birds flu. Vaccination schedules.

#### **UNIT: V**

Poultry egg production – composition and nutritive value of egg - use of feathers and poultry manure. Economics of poultry. Field visit.

#### **TEXT BOOKS:**

1. Arumugam, N., Murugan, S., Johnson Rajeshwar, J. and Ram Prabhu, R. (2005) Applied Zoology, Saras Publication, Kanyakumari.
2. Prakash Malhotra (2008) Economic Zoology, Adhyayna Publishers & Distributors, New Delhi.

#### **REFERENCE BOOKS:**

1. Isabel Guerrero and Legarreta (2010) Hand Book of Poultry Science and Technology, John Wiley and Sons, New Jersey.
2. Jawaid, A. and Sinha, S. P. (2008) A Handbook of Economic Zoology. S. Chand & Company, New Delhi.
3. Khan, A. A. (2007) Encyclopedia of Economic Zoology. 2 vols. Anmol Publications Pvt. Ltd., New Delhi.
4. Upadhyay, V.B. (2006) Economic Zoology. Rastogi Publications, Meerut, India.
5. Jabde and Pradip V (2005) Text Book of Applied Zoology, Discovery Publishing House, New Delhi.
6. Scott, M.L., Nesheim, M.C. and Young, R.J. (1982) Nutrition of the Chicken. 3rd ed. Ithaca, New York.
7. Biester, H.E. and Schwarte, L.H. (1969) Diseases of Poultry, 5th Edn. Oxford and IBH Publishing Co, New Delhi.

## B.Sc. ZOOLOGY

Semester- VI  
SBEC -VI  
Code- 18U6ZOS06

Hrs/Week: 2  
Credits: 2

### AQUACULTURE

#### Objective:

- To learn the basic procedure for aquaculture
- To promote the socio economic status of rural women through new entrepreneurship by aquaculture
- To learn advanced harvesting techniques in aquaculture

#### Unit I

Present status and Scope of Fisheries in India – Commercially important Fishes – Food and feeding habits of important edible fishes – Age and Growth: Method of determination

#### Unit II

Aquaculture types – Farm types – Site Selection and Construction of Farm maintenance and management – Eradication of algal Blooming and predators – Water Quality Management in culture ponds – Natural and supplement feed – Formulated feed for Fishes and Prawn

#### Unit III

Induced breeding – Hypophysation – Factors of Induced spawning – transport of fish feed – Fish Diseases and Control methods

#### Unit IV

Culture of Fresh water Prawn *Macrobrachium* – Marine Prawn *Penaeus* – Pearl Oyster – Green Mussel culture – Mono sex and poly sex culture – Integrated fish farming

#### Unit V

Fishing – Grafts and gears – Fish harvesting – Traditional and Modern Method – Eco sounding method – Electric Fishing – Fish preservation – Drying, salting, smoking, canning and refrigeration – Economics and Marketing of fishes

#### TEXT BOOKS:

1. Pillay T.V.R and Kutty M.N., (2005) Aquaculture: Principles and Practices, John Wiley & Sons
2. Pandey, B.N. and Sadhana, D. (2007) Aquaculture Principles and Practices, S.B. Nangia A.P.H Publishing Corporation, New Delhi.
3. Arumugam, N., Murugan, S., Johnson Rajeshwar, J. and Ram Prabhu, R. (2005) Applied Zoology, Saras Publication, Kanyakumari.
4. Shanmugam, K. (1992) Fishery Biology and Aquaculture, Leo Pathippagam, Chennai.
5. Santhanam, R. (1990) Fisheries Science, Daya Publishing House, New Delhi

#### REFERENCE BOOKS:

1. Kamaleswar Pandey and Shukla, J.P. (2005) Fish and Fisheries, Rastogi Publications, Meerut.
2. Yadav, M (2003) Economic Zoology, Discovery Publishing House, Rastogi Publications, Meerut.
3. Agarwal, S.C. (1994) A hand book of fish farming, Narendra Publishing House, New Delhi.
4. Chakrabarthy, M.N. (1998) Biology, Culture and Production of Indian major carps, Narendra Publishing House, New Delhi.
5. Hall, C.B. (1999) Ponds and fish culture, Agro botanical Publishers, India.
6. Fresh water Aquaculture Rath R.K., 2000. Laurier Books Ltd.

**ANIMAL PHYSIOLOGY, DEVELOPMENTAL BIOLOGY, MICROBIOLOGY AND IMMUNOLOGY**

**Objective:**

- To gain the practical knowledge about the Animal Physiology, Developmental Biology, Microbiology And Immunology
- To understand the uses of instruments 0
- To learn the different development stage of chick

**Animal physiology:**

1. Effect of temperature on salivary amylase activity
2. Qualitative analysis of excretory products
3. Estimation of oxygen consumption in fish.
4. Estimation of hemoglobin. (Determination of anemic condition of the blood samples).
5. Qualitative analysis of carbohydrates, Protein and Lipid.

**Developmental Biology:**

1. Mounting of Chick embryo.
2. Various stages of chick embryo (Permanent slide identification)

**Microbiology and Immunology**

1. Culture techniques – Streak plate, Pour plate.
2. Media preparation
3. Vaccination schedule

**Spotters:**

1. Haemoglobinometer.
2. Haemocyto meter
3. Kymograph
4. Spigmomanometer
5. Yolk plug stage
6. Blastula
7. Gastrula
8. Placenta
9. Inoculation loop
10. Autoclave
11. Laminar air flow
12. Chemosterilants (Chemicals)
13. Human egg
14. Human sperm
15. Antiserum A and B

**ECOLOGY AND EVOLUTION**

**Objective:**

- To develop the practical knowledge about sample collection (Water & Soil)
- To learn the evolution of man and paleontological changes

**Ecology and Evolution:**

1. Estimation of dissolved oxygen content in given water sample (Winkler's Method).
2. Estimation of carbon dioxide (CO<sub>2</sub>) in water samples.
3. Estimation of salinity in the given water sample.
4. Estimation of carbonates and bicarbonates in water samples.
5. Examination of intertidal fauna of rocky shore sandy shore and muddy shore.
6. Study of pond ecosystem.
7. Mounting of plankton (any two).
8. Homologous organs
9. Evolution of man
10. Tour report

**Spotters:**

1. Sea anemone on hermit crab.
2. Plankton net.
3. Mysis
4. Daphnia
5. Cyclops
6. Cypris
7. Nauplius Larva
8. Use of Rain gauge
9. Maximum and Minimum thermometer
10. Aneroid Barometer
11. Any three fossils
12. Any three Endangered animals of India