

VIVEKANANDHA

COLLEGE OF ARTS AND SCIENCES FOR WOMEN

ELAYAMPALAYAM, TIRUCHENGODE (Tk.), NAMAKKAL (Dt.).

(Affiliated to Periyar University, Approved by AICTE,

Re-Accredited with 'A' Grade by NAAC)

Recognized under section 2(f) & 12(B) of UGC ACT 1956,

An ISO 9001:2008 (Certificate institution)



DEPARTMENT OF ZOOLOGY

SYLLABUS & REGULATIONS

FOR CANDIDATES ADMITTED FROM

2021 - 2022 ONWARDS

UNDER AUTONOMOUS & OBE PATTERN

VIVEKANANDHA EDUCATIONAL INSTITUTIONS

Angammal Educational Trust

Elayampalayam, Tiruchengode (Tk.), Namakkal (Dt.)

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**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)
ELAYAMPALAYAM, TIRUCHENGODE-637205
PG and RESEARCH DEPARTMENT OF ZOOLOGY**

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.

DEPARTMENT OF ZOOLOGY

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

I. PROGRAMME EDUCATIONAL OBJECTIVES

1. To formulate the graduates to an afford fundamentals and applications of present taxonomical concepts like classify, identify the species (Invertebrata and Chordata).
2. To endorse research in the thrust areas of zoology ranging in wide areas like applied Zoology, Conservation Biology, Radiation Biology, Toxicology & Gene mutation field through zoology.
3. To equip with the up-to-date skills of evolving technologies as per an industrial forecast

II. PROGRAMME SPECIFIC OBJECTIVES (PSO)

- To create interest among students so that they can pursue higher education in Zoology to take up the career of teaching, research including the thrust area like Ecosystem, Ecology etc.,
- To make graduates understand zoology with Know and develop skill on self employment avenue in zoological science such as Agricultural Entomology, Vermitechnology, Apiculture, Sericulture, Aquaculture and Ornamental Fish Farming.
- To promote students with leadership quality to organize seminar, guest lectures and promote research based projects, to undergo internship programmes in the emerging areas of biological sciences.

III. PROGRAM OUTCOME

After successfully completing B. Sc. (Zoology) Programme students will be able to:

- PO1: Develop the ability of understanding the basic concepts and inter relating life science domains for developing competitive skill metrics
- PO2: Revealing life science views and suggestions with the impartment and explore in precise manner with life science professionals and public
- PO3: Capability of crucial thoughts by forming experimental ideas and meet out specific competences and expectations in different Zoological sectors
- PO4: Students shall able to explain by effectively observing the condition and challenges existing in different biological systems
- PO5: Evaluating various challenges, arguments and make accurate decision by integrating clinical, immunological, pharmaceutical domains
- PO6: Define problems, formulate & test the hypotheses, analyse and interpret the data related to animal, plant, microbial and biochemical systems
- PO7: Students shall map out the tasks of fellow mates, directing them to formulate the vision of life science by improvising their managerial skill set
- PO8: Exploring the views and ideas with qualitative and quantitative biological data for developing logical and convincing arguments
- PO9: Knowledge values of multiple domains of life science with the capability of effective engagement in a multicultural society
- PO10: Students shall able to work effectively and access the utility of ICT with biologically diversified teams with assistance
- PO11: Promote confidence level for executing, managing and completing a biological assignment with effective and reproducible solutions
- PO12: Students shall able to meet out their own learning needs by appreciating environment and sustainability from a range of current research
- PO13: Students shall develop the habit of avoiding unethical misinterpretation of research data derived, committing plagiarism, non-adherence of IPR
- PO14: Students shall apply the knowledge of basic life science and its specific transferable skills for identifying the issues and solving problems
- PO15: Students shall able to acquire knowledge to meet out the social, economic and cultural objectives which are relevant to life science related job trades

IV. 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.

V. DURATION OF THE COURSE

- The course shall extend over a period of three academic years consisting of six semesters. Each academic year will be divided into two semesters. The first semester will consist of the period from July to November and the second semester from December to March.
- The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekanandha College of Arts and Sciences for Women (Autonomous) with the approval of Periyar University.

VI. ELIGIBILITY FOR EXAMINATION

A candidate will be permitted to appear for the end semester examination only on earning 75 % of attendance and only when his/her conduct has been satisfactory. It shall be open to grant exemption to a candidate for valid reasons subject to conditions prescribed.

VII. PATTERN OF QUESTION PAPER

PART- A (Objective)	Answer all Questions	20 x 1 = 20 Marks
PART- B (500 words)	Answer all 5 Questions (either or type)	5 x 5 = 25 Marks
PART - C (1000 words)	Answer any 3 Questions (three out of five)	3 x 10 = 30 Marks

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
Total	= 25 Marks

Practical will be as under:

1. Model Exam	- 20 Marks
2. Observation Note	- 10 Marks
3. Attendance	- 10 Marks
Total	= 40 Marks

IX. 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

X. DISTRIBUTION OF MARKS

THEORY:

Internal Assessment - 25 marks

External Examination - 75 marks

PRACTICALS & GROUP PROJECT :

Internal Assessment - 40 marks

External Examination - 60 marks

XI. COMMENCEMENT OF THESE REGULATIONS

These regulations shall take effect from the academic year 2020 - 2021 i.e. for the students who are to be admitted to the first year of the course during the academic year 2020 – 2021 and thereafter.

XII. Employments and higher studies Opportunities for B.Sc. Zoology students

- Employment areas of B.Sc., Zoology includes: Zoological Museum, Field Surveyor, pharmaceutical companies, Environmental Agencies, Medical Laboratories, Veterinary Farms, Medical Representatives, Sales manager of bio-products, etc.,
- The graduates can seek admission in Master of Science where the student needs to go through the deep knowledge of science.
- B.Sc. course is globally agreeable where the students from science theme can pursue from any of the approved university.
- The graduates are eligible for admission in M.Sc., degree course in Zoology, Life Sciences, Marine Biology, Aquaculture, Forensic Science, Genetics, Microbiology, Biotechnology, Integrated Biology, Physiology, Aquaculture, Marine Biotechnology, integrated Ph.D, P.G diploma courses in lab technology, Radiology. U.G are eligible for B.Ed.,
- After completing B.Sc. Zoology, can specialize in various fields within zoology like Arachnology, Entomology, Arthropodology, Apiology, Cetology, Anthrozoology, Conchology, Ethology, Helminthology, Mammalogy, Neuroethology, Myrmecology, Nematology, Ornithology, Paleozoology, Malacology, Primatology, Herpetology etc.,

XIII. TRANSITORY PROVISION

Candidates who were admitted to the UG course of study before 2021-2022 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 2024 Thereafter, they will be permitted to appear for the examination only under the regulations then in force

COURSE SCHEME AND SCHEME OF EXAMINATIONS
B.Sc. DEGREE COURSE IN ZOOLOGY
CHOICE BASED CREDIT SYSTEM (OBE PATTERN)

Sem	Subject Code	Part	Course	Subject Title	HRS/Week	Credit	Int. Mark	Ext. Mark	Mark
I	21U1LT01	I	Languages	Tamil or anyone Language – I	6	3	25	75	100
	21U1LE01	II	Languages	Communicative English I	6	3	25	75	100
	21U1ZOC01	III	Core I	Invertebrata	5	4	25	75	100
	21U1ZOC01	III	Core Practical-I	Invertebrata	3	2	40	60	100
	21U1BOA01	III	Allied Paper	Allied Botany Theory-I	5	4	25	75	100
	21U2BOAP01	III	Allied Practical-I	Allied Botany Practical	3	2	40	60	100
	21U1VE01	IV	Value Education	Yoga- Value Education	2	2	25	75	100
Total					30	20	125	375	500
II	21U2LT02	I	Languages	Tamil or anyone Language – II	6	3	25	75	100
	21U2LE02	II	Languages	Communicative English II	6	3	25	75	100
	21U2ZOC02	III	Core II	Chordata	4	4	25	75	100
	21U2ZOC02	III	Core Practical II	Chordata	3	2	40	60	100
	21U2BOA02	III	Allied Paper	Allied Botany Theory-II	4	4	25	75	100
	21U2BOAP01	III	Allied Practical -II	Allied Botany Practical	3	2	40	60	100
	21U2ES01	IV	-	Environmental Studies	4	4	25	75	100
Total					30	22	205	495	700
III	21U3LT03	I	Languages	Tamil or anyone Language – III	6	3	25	75	100
	21U3LE03	II	Languages	Communicative English III	6	3	25	75	100
	21U3ZOC03	III	Core III	Cell Biology	4	5	25	75	100
	21U3ZOC03	III	Core Practical- III	Cell Biology	3	2	40	60	100
	21U3CHA01	III	Allied Paper	Allied Chemistry Theory -I	4	3	25	75	100
	21U4CHAP01	III	Allied Practical	Allied Chemistry Practical	3	-	-	-	-
	21U3ZOS01	IV	SBEC-I	Ornamental Fisheries	2	2	25	75	100
--	IV	NMEC- I	Selected by students	2	2	25	75	100	
Total					30	20	150	450	600
IV	21U4LT04	I	Languages	Tamil or anyone Language – IV	6	3	25	75	100
	21U4LE04	II	Languages	Communicative English IV	6	3	25	75	100
	21U4ZOC04	III	Core IV	Genetics	4	5	25	75	100
	21U4ZOC04	III	Core Practical IV	Genetics	3	2	40	60	100
	21U4CHA02	III	Allied Paper	Allied Chemistry Theory -II	4	3	25	75	100
	21U4CHAP01	III	Allied Practical	Allied Chemistry Practical	3	3	40	60	100
	21U4ZOS02	IV	SBEC-II	Agriculture Entomology	2	2	25	75	100
--	IV	NMEC-II	Selected by Students	2	2	25	75	100	
8Total					30	24	230	570	800
V	21U5ZOC05	III	Core V	Evolution	5	5	25	75	100
	21U5ZOC06	III	Core VI	Developmental Biology	5	5	25	75	100
	21U5ZOC07	III	Core VII	Microbiology & Immunology	5	5	25	75	100
	21U5ZOC05	III	Core Practical- V	Developmental Biology & Evolution	3	3	40	60	100
	21U5ZOC06	III	Core Practical- VI	Microbiology & Immunology	3	2	40	60	100
	21U5ZOE01	III	Elective-I	Biotechnology	5	3	25	75	100
	21U5ZOS03	IV	SBEC-III	Sericulture	2	2	25	75	100
21U5ZOS04	IV	SBEC-IV	Vermi Technology	2	2	25	75	100	
Total					30	27	150	450	600
VI	21U6ZOC08	III	Core Course VIII	Animal Physiology	5	5	25	75	100
	21U6ZOC09	III	Core Course IX	Ecology	5	5	25	75	100
	21U6ZOC10	III	Core Course X	Wild Life Biology	5	4	25	75	100
	21U6ZOC07	III	Core Practical- VIII	Ecology & Wild Life Biology	3	2	40	60	100
	21U6ZOC08	III	Core Practical- VII	Animal Physiology &	3	2	40	60	100
	21U6ZOE02	III	Elective-II	Biochemistry	4	3	25	75	100
	21U6ZOS05	V	SBEC-V	Poultry Science	2	2	25	75	100
	21U6ZOS06	IV	SBEC-VI	Aquaculture	2	2	25	75	100
	21U6ZOPR01	III	Elective III	Group Project	1	1	40	60	100
21U6EX01	V	Extension Activities		-	1	-	-	-	
Total					30	27	230	570	800

Semester- I
Core Paper- I
Code: 21U1ZOC01

Hrs/Week: 5
Credits: 5

INVERTEBRATA

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- Malaria, Amoebiasis, Trypanosomiasis and Leishmaniasis.

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 – **Earthworm** – External morphology, Digestive system 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 – Prawn:– External morphology, Digestive system, Excretory system and Appendages of prawn.. Larval forms of Crustaceans. Economic importance of insects.

UNIT: V (15 Hours)

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

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.

B.Sc. ZOOLOGY

Semester-I
Core Practical- I
Code: 21U1ZOC01

Hrs/Week: 3
Credits: 2

INVERTEBRATA

I. Major Practicals: (20 Marks)

1. Cockroach – Nervous system (Voucher Specimen)
2. Cockroach – Digestive system (Voucher Specimen)
3. Prawn digestive system (Voucher Specimen)
4. Prawn nervous system (Voucher Specimen)

II. Minor Practicals: (10 Marks)

5. Earthworm body setae
6. Different mouth parts of Mosquito, House fly, Honey bee, and Cockroach
7. Mounting of prawn appendages.

III. Spotters: (20 Marks)

8. Classify Giving Reasons:

Amoeba, Euglena, Sycon sponge, Aurelia, Liver fluke, Ascaris, Halothuria, Cockroach, Fresh water mussel, Star fish.

9. Drawing of Labelled Sketches:

Paramecium, T.S. Earthworm, T.S. of Fasciola, Ephyra larva, Cercaria larva

10. Biological significance:

Sponge Gemmule, Physalia, Leech, Bipinnaria Larva, Limulus, Peripatus, Sea anemone on Hermit Crab

11. Relate structure and function:

Spicules of Sponges, Tube feet of Star fish, Antennule of prawn, Teania- Scolax, Nereis – Parapodium.

B.Sc. BOTANY

Semester- I
Allied Paper- I
Code: 21U1ZOA01

Hrs/Week: 5
Credits: 3

INVERTEBRATE AND CHORDATE ZOOLOGY**Course Objectives:**

To acquire knowledge on the animal classification based on characters comparative anatomy of vertebrate and Invertebrates.

Course Outcomes:

- CO 1- Classify the animal species based on the morphological and anatomical features
 CO 2- Learn the locomotion and feeding behavior of invertebrates
 CO 3- Compare the functional morphology of vertebrates and invertebrates.
 CO 4- Learn the compare study on physiology system of Invertebrates and Chordates.
 CO 5- Compare the study on function of alimentary and physiological system in chordates.

UNIT: I (10 Hours)

Outline classification of Animal kingdom: **Protozoa:** External Morphology of Paramecium – and Conjugation. **Porifera:** Cellular Structure of Leucosolina.. **Coelenterata:** External morphology of Aurelia and its life history
 General Topic: Protozoan disease of man (Malaria and Amoebiasis)

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 and appendages of prawn

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

Echinodermata: Star fish – External structure

General Topic: Water vascular system in Echinodermata.

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: External morphology and circulatory system of Calotes

General topic : 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.

General Topic: Dentition in mammals

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

WEB SOURCES:

- <https://www.itis.gov/>
- <https://lib2.colostate.edu/wildlife/taxonomy.html>
- <https://en.wikipedia.org/wiki/Invertebrate>
- <https://en.wikipedia.org/wiki/Vertebrate>
- https://www.diffen.com/difference/Invertebrate_vs_Vertebrate
- https://Bird-way-to-breathe_Eleanor-Lutz.gif
- <https://asknature.org/?s=vertebrate>

B.Sc. BOTANY

Semester-I
Allied Practical- I
Code: 21U1ZOAP01

Hrs/Week: 3
Credits: 1

ALLIED ZOOLOGY PRACTICAL - I

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)

4. Earthworm body setae
5. mouth parts of Cockroach

III. Spotters: (20 Marks)

6. Classify Giving Reasons: Amoeba, Paramecium, Aurelia, Chaetopterus, Halothuria, Amphioxus, Salpa, Bufo, Limulus and Russell's Viper.
7. Drawing of Labelled Sketches: Fasciola, T.S. of Fasciola, Ephyra larva, quill feather, pigeon-pectoral girdle, pelvic girdle.
8. Biological significance of the following: Sponge Gemmule, Physalia, Leech, Bipinnaria Larva, Ichthyophis, Ascidian tadpole.
9. Relating structure and function of the following: Spicules (Sponges), Starfish – tube feet, Antennule of prawn, pristin, Echinis, Bat and Cobra.
10. Comment on Respiratory / Skeletal structure / dentition of the following: Starfish, Synsacrum, Dentition of rabbit and Dog.

B.Sc. ZOOLOGY**Semester- II****Hrs/Week: 5****Core Paper- II****Credits: 5****Code: 21U2ZOC02****CHORDATA****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)

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

General Topic: Salient features and affinities of Prochordata

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 (10 Hours)

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

General Topic: Parental care in Amphibian.

UNIT: III (15 Hours)

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

General Topic: Identification of poisonous and non-poisonous snakes. Status of Sphenodon

UNIT: IV (15 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: V (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.

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.

B.Sc. BOTANY

Semester- II
Allied Paper- II
Code: 21U2ZOA02

Hrs/Week: 5
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 with reference to Menders Monohybrid and Dihybrid experiment

UNIT: II (12 Hours)

Developmental Biology: Gamatogenesis: Spermatogenesis and ultra structure of human sperm. Oogenesis and ultra structure of human Ovum. - Fertilization and Cleavage. Blastulation and Gastrulation in Frog.

UNIT: III (8 Hours)

Physiology: Digestion & absorption in man. Excretion, Structure and working mechanism of human heart.

UNIT: IV (10 Hours)

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

UNIT V (10 Hours)

Evolution: Origin of life , Lamarkism and Neo-Lamarkism, Darwinism and Neo-Darwinism, Geological time scale,

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. ZOOLOGY

Semester-II
Core Practical-
Code: 21U2ZOCP02

Hrs/Week: 3
Credits: 2

CHORDATA _ CORE PRACTICAL-II

I. Major Practicals: (20 Marks)

1. Frog – Circulatory system (Voucher Specimen)
2. Frog – Digestive system (Voucher Specimen)
3. Frog-Auricle system
4. Frog -Vein system

II. Minor Practicals: (10 Marks)

5. Frog-Mountain in Brain
6. Identify Poison & Non-Poison Snakes
7. Mounting of Placoid scales

III. Spotters: (20 Marks)

8.Classify Giving Reasons:

Amphioxus, Bufo, Limulus, and Viper

9.Drawing of Labelled Sketches:

Pigeon Pectoral Girdle, Pelvic girdle, Dentition of Rabbit and Dog.

10. Biological significance:

Parental care in Ambhipians, Ichthyophis, Acidian Todpole

11. Relate structure and function:

Bat, Cobra

B.Sc. ZOOLOGY

Semester- III
Core Paper- III
Code: 21U3ZOC03

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) – Krebs'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 **Compound Microscope, Electron Microscope** and Phase contrast microscope. Cell fractionation - Isolation of sub cellular components - Fixation - Sectioning Principles -

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.Ccell (1996) Molecular Biology- Concept and Experiments, Jhon Wiley & Sons Inc, New York.

B.Sc. ZOOLOGY

Semester- III
SBEC- I
Code: 21U3ZOSO1

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 types of ornamental fish culture Origin of ornamental fish keeping - Current trends in ornamental fish farming in India and worldwide. Construction of Home aquarium: size, shape, substrate.

UNIT II: (6 Hours)

Setting up of tanks **with accessories**– – Aquarium plants: Types , important and uses. - Introducing fishes to the aquarium. Water quality **Managements .Filterations - Physical, chemical and biological methods**

UNIT III: (6 Hours)

Species of ornamental fishes – taxonomy and morphology of gold fish, guppies, swordtail. Marine fishes – Angel and butterfly and **clown** fishes. Other ornamental organisms – Anemones, Octopus, Star fish etc.

UNIT IV: (6 Hours)

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

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.

NON MAJOR ELECTIVE COURSE

Semester- III
NMEC- I
Code: 21U3ZON01

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: Morigulture, 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- III
Code: 21U3ZOP02

Hrs/Week: 3
Credits: 2

Core Practical - III : CELL BIOLOGY

1. Preparation of a onion root tip for observation of stages of mitosis
2. Principles and utility of microscopes
3. Temporary stained preparation and study striated muscle fibres in cockroach
4. Observation of distinguish features of different eukaryotic cells
5. Measurement of Stomatal cells
6. Preparation of blood smear and differential staining of blood cells
7. Microscope and staining techniques
8. Study of Prokaryotic, Eukaryotic plant and animal cells
9. Preparation of Temporary mount of onion peel to observe and study epidermal cells
10. Preparation of temporary stained mount of human cheek cells

Spotters

- (i) Microscope
- (ii) Occular
- (iii) Mitosis stages
- (iv) Meiosis stages
- (v) Stage micrometer
- (vi) Ribosome
- (vii) Mitochondria
- (viii) Endoplasmic reticulum
- (ix) Golgicomplex
- (x) Camera lucida

B.Sc. ZOOLOGY

Semester- IV
Core Paper- IV
Code: 21U4ZOC04

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 abberations 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 thalessemia, 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.,

NON MAJOR ELECTIVE COURSE

Semester- IV
NMEC- II
Code: 21U4ZON02

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: 21U4ZOS02

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)

Classification of insects (Upto order flowPest 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 - IV
Code: 21U4ZOP04

Hrs/Week: 3
Credits: 4

GENETICS

Objectives:

- To learn the cytological techniques
 - To know the mutation and its variation
 - To assess the beneficial and harmful mutations
1. Identification of blood group
 2. Counting of RBC using haemocytometer
 3. Counting of WBC using haemocytometer
 4. Study of different types of plastids
 5. Observation of common mutants of *Drosophila*
 6. Preparation of mounting of the salivary gland in *Drosophila* larva
 7. Preparation and analysis of pedigree charts

SPOTTERS

- (i) DNA
- (ii) RNA
- (iii) tRNA
- (iv) Haemocytometer
- (v) DNA Replication
- (vi) Down syndrome
- (vii) Protein synthesis
- (viii) RBC Pipette
- (ix) WBC Pipette
- (x) Neubauer's chamber

B.Sc. ZOOLOGY

Semester- V
Core Paper- V
Code: 21U5ZOC05

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

Nutrition and Digestion: Types of Nutrition, feeding mechanism. Intracellular and extracellular digestion. Digestion of carbohydrates, proteins & lipids and absorption. **Metabolism:** Carbohydrate- Glycogenesis and Glycolysis. lipid metabolism – Beta oxidations – ketosis; Protein metabolism – deamination – transamination. **Nutrition Requirements and Balanced diet – Types of diet**

UNIT: II

Respiration Types of respiration and respiratory pigments. –Structure of hemoglobin – Transport of respiratory gases – Oxygen transport and Oxygen disassociation curve – Carbon-dioxide transport – Chloral shift - Hb buffer system. **Circulation:** Neurogenic and Myogenic hearts. Composition of blood – Blood clotting – Heart beat – origin – conduction – Cardiac cycle – Blood pressure, ECG.

UNIT: III

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

UNIT: IV

Endocrine glands: Structure and functions of Hypothalamus, Pituitary, Adrenal Glands, Thyroid, Parathyroid, Pancrease, Islets of Langerhans, Pineal gland, Thymus, Testes, ovaries and **Gastrointestinal hormones.** , 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. **Osmoregulation** – ionic regulation of fresh water , marine water and terrestrial animals. ; **Thermoregulation** – regulation of body temperature in animal.

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: 21U5ZOC06

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 & Types of eggs.

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 – (Amphioxus and chick).

UNIT: IV

Embryonic membranes and their functions. 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, 7th Edition, Sinauer Associates, Inc. Publishers, Massachusetts.

B.Sc. ZOOLOGY

Semester- V
Core Paper- VII
Code: 21U5ZOC07

Hrs/Week: 5
Credits: 5

MICROBIOLOGY & 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 Ed). 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: 21U5ZOE01

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: 21U5ZOS03

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: 21U5ZOS04

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, 3rd Edition, Chapman Publications, London.

B.Sc. ZOOLOGY

Semester- VI

Hrs/Week: 5

Core Paper- VIII
Code: 21U6ZOC08

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: 21U6ZOC09

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
Core Paper- X
Code: 21U6ZOC10

Hrs/Week: 5
Credits: 4

WILD LIFE BIOLOGY

B.Sc. ZOOLOGY

Semester- VI
Elective- II
Code- 21U6ZOE02

Hrs/Week: 4
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 and Properties, Structure & 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

Hrs/Week: 2

SBEC -V

Credits: 2

Code- 21U6ZOS05

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,. 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- 21U6ZOS06

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.

B.Sc. ZOOLOGY

Semester- VI
Core Practical-III
Code- 21U6ZOC03

Hrs/Week: 3
Credits: 5

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

B.Sc. ZOOLOGY

Semester- VI
Core Practical-IV
Code- 21U6ZOC04

Hrs/Week: 3
Credits: 4

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 (CO₂) 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