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

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 ZOOLGY

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 outs the social, economic and cultural objectives which are relevant to Zoology 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 2020-2021 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 2023 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
SYLLABUS UNDER CBCS PATTERN WITH EFFECT FROM 2020 - 2021 ONWARDS

SEM	PART	SUB CODE	TITLE OF THE SUBJECT	Hrs.		CREDIT	MARKS		
				Lect.	Lab		CIA	EA	TOTAL
SEMESTER – I									
I	I	20U1LT01	Foundation Tamil – I	6	-	3	25	75	100
	II	20U1LE01B	Foundation English - I	6	-	3	25	75	100
	III	20U1ZOC01	Invertebrata	4	-	4	25	75	100
	III	20U1ZOCP01	Core Practical I - Invertebrata	-	3	2	40	60	100
	III	20U1BOA01	Allied Botany Theory - I	4	-	4	25	75	100
	III	20U2BOAP01	Allied Botany Practical	-	3	2	40	60	100
	IV	18U1VE01	Yoga - Value Education	2	-	2	25	75	100
	IV	21UILSPE01	Professional English - I	2	-	4	25	75	100
Total				**24**	**6**	**24**	**230**	**570**	**800**
SEMESTER – II									
II	I	20U1LT01	Tamil or anyone Language – II	6	-	3	25	75	100
	II	20U1LE01B	Communicative English II	6	-	3	25	75	100
	III	20U2ZOC02	Chordata	4	-	4	25	75	100
	III	20U2ZOCP02	Core Practical II - Chordata	-	3	2	40	60	100
	III	20U2BOA02	Allied Botany Theory - II	4	-	4	25	75	100
	III	20U2BOAP01	Allied Botany Practical	-	3	2	40	60	100
	IV	20U2ES01	Environmental Studies	2	-	4	25	75	100
	IV	21UILSPE02	Professional English - II	2		4	25	75	100
Total				**24**	**6**	**26**	**230**	**570**	**800**
SEMESTER – III									
III	I	18U3LT03	Foundation Tamil – III	6	-	3	25	75	100
	II	20U3LE03	Foundation English - III	6	-	3	25	75	100
	III	20U3ZOC03	Cell Biology	4	-	4	25	75	100
	III	20U3ZOCP03	Core Practical III - Cell Biology	-	3	3	40	60	100
	III	20U3CHA01	Allied Chemistry Theory - I	4	-	4	25	75	100
	III	20U4CHAP01	Allied Chemistry Practical	-	3	-	-	-	-
	IV	20U3ZOS01	Ornamental Fisheries	2	-	2	25	75	100
	IV	20U3ZON01	Sericulture (Elected by students)	2	-	2	25	75	100
Total				**24**	**6**	**21**	**190**	**510**	**700**
SEMESTER – IV									
IV	I	20U4LT04	Tamil or anyone Language – IV	6	-	3	25	75	100
	II	20U4LE04	Communicative English IV	6	-	3	25	75	100
	III	20U4ZOC04	Genetics	4	-	4	25	75	100
	III	20U4ZOCP04	Core Practical IV - Genetics	-	3	3	40	60	100
	III	20U4CHA02	Allied Chemistry Theory - II	4	-	4	25	75	100
	III	20U4CHAP01	Allied Chemistry Practical	-	3	3	40	60	100
	IV	20U4ZOS02	Agriculture Entomology	2	-	2	25	75	100
	IV	20U4ZON02	Apiculture (Elected by Students)	2	-	2	25	75	100
Total				**24**	**6**	**24**	**230**	**570**	**800**

SEM	PART	SUB CODE	TITLE OF THE SUBJECT	Hrs.		CREDIT	MARKS		
				Lect.	Lab		CIA	EA	TOTAL
V	III	20U5ZOC05	Evolution	5	-	3	25	75	100
	III	20U5ZOC06	Developmental Biology	5	-	3	25	75	100
	III	20U5ZOC07	Microbiology & Immunology	5	-	4	25	75	100
	III	20U5ZOCP05	Core Practical V - Evolution & Developmental Biology	-	3	3	40	60	100
	III	20U5ZOCP06	Core Practical VI - Microbiology & Immunology	-	3	2	40	60	100
	III	20U5ZOE01	Biotechnology	5	-	3	25	75	100
	IV	20U5ZOS03	Sericulture	2	-	2	25	75	100
	IV	20U5ZOS04	Vermitechnology	2	-	2	25	75	100
Total				**24**	**6**	**22**	**230**	**570**	**800**
SEMESTER – VI									
VI	III	20U6ZOC08	Animal Physiology	5	-	3	25	75	100
	III	20U6ZOC09	Ecology	5	-	3	25	75	100
	III	20U6ZOC10	Wild Life Biology	5	-	4	25	75	100
	III	20U6ZOCP07	Core Practical VII - Ecology & Wild Life Biology	-	3	2	40	60	100
	III	20U6ZOCP08	Core Practical VIII - Animal Physiology	-	3	2	40	60	100
	III	20U6ZOE02	Biochemistry	4	-	3	25	75	100
	IV	20U6ZOS05	Poultry Science	2	-	2	25	75	100
	IV	20U6ZOS06	Aquaculture	2	-	2	25	75	100
	IV	20U6ZOPR01	Group Project	1	-	1	40	60	100
	V	20U6EX01	Extension Activities	-	-	1	-	-	-
Total				**24**	**6**	**23**	**270**	**630**	**900**
TOTAL CREDITS - 140									

Semester- I **Hrs/Week: 5**
Core Paper- I **Credits: 4**
Code: 20U1ZOC01

INVERTEBRATA

COURSE OUTCOME

- ✓ Gain deep knowledge in animal kingdom
- ✓ Student have the knowledge on diversity of invertebrate.
- ✓ The students are understand and maintenance of invertebrate species
- ✓ Evolutionary relationship among invertebrate group
- ✓ The students are understanding morphological and behavior of invertebrate
- ✓ The students understood interaction of organisms with their environments and their adaptive mechanisms.

UNIT: I (15 Hours)

Introduction of 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 – **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, Meeerut

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 **Hrs/Week: 3**
Core Practical- I **Credits: 2**
Code: 20U1ZOCP01

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 **Hrs/Week: 5**
Allied Paper- I **Credits: 4**
Code: 20U1ZOA01

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 comparative study on system physiology of Invertebrates and Chordates.
CO 5- Comparative 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 Leucosolinia.. **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, Meeerut.

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 **Hrs/Week: 3**
Allied Practical- I **Credits:2**
Code: 20U1ZOAP01

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, pristis, 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: 4**
Core Paper- II **Credits: 4**
Code: 20U2ZOC02

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 **Hrs/Week: 4**
Allied Paper- II **Credits: 4**
Code: 20U2ZOA02

ALLIED ZOOLOGY

Objective:

- To acquire knowledge about zoology in relation to cell biology, developmental biology, phusiology 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. Physiology of Excretion in man, 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 **Hrs/Week: 3**
Core Practical- **Credits: 2**
Code: 20U2ZOCP02

CHORDATA _ CORE PRACTICAL-II

I. Major Practicals: (20 Marks)

1. Frog – Circulatory system (Voucher Specimen)
2. Frog – Digestive system (Voucher Specimen)
3. Frog-Aterial System
4. Frog -Venous system

II. Minor Practicals: (10 Marks)

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

III. Spotters: (20 Marks)

8.Classify Giving Reasons:

Amphioxus, Bufo, Fish, Viper, Pigeon and Manis

9.Drawing of Labelled Sketches:

Pigeon Pectoral Girdle, Pelvic girdle, Dentition of Rabbit and Dog, Human Skull, Naja naja

10. Biological significance:

Ichthyophis, Ambystoma, Acidian, Bat, Chamaeleon,

11. Relate structure and function:

Cycloid and Ctenoid scale, Synsacrum, Rabbit forelimb and hindlimb bones

B.Sc. ZOOLOGY

Semester- III **Hrs/Week: 4**
Core Paper- III **Credits: 4**
Code: 20U3ZOC03

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** - Ultra structure, Chemical composition and functions. **Golgi Complex** - Ultra Structure, Chemical composition and functions.

UNIT: II (12 Hours)

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

B.Sc. ZOOLOGY

Semester- III **Hrs/Week: 2**
SBEC- I **Credits: 2**
Code: 20U3ZOSO1

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. Filtrations - Physical, chemical and biological methods

UNIT III: (6 Hours)

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

UNIT IV: (6 Hours)

Nutritional requirements of aquarium fishes – Live feed and artificial feeds. Transportation **-** 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 **Hrs/Week: 2**
NMEC- I **Credits: 2**
Code: 20U3ZON01

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. Types of silk - mulberry, tasar, muga and 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 TECNIQUES: 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. G. Ganga & Sulochana chetty, An Introduction to Sericulture (IInd edition).
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 **Hrs/Week: 3**
Code: 20U3ZOCP03 **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 micrometer
(iii) Stage micrometer
(iv) Mitosis stages
(v) Meiosis stages
(vi) Ribosome
(vii) Mitochondria
(viii) Endoplasmic reticulum
(ix) Golgicomplex
(x) Camera lucida

B.Sc. ZOOLOGY

Semester- IV **Hrs/Week: 4**
Core Paper- IV **Credits:4**
Code: 20U4ZOC04

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 – experiment – Human karyotype preparation and chromosomal syndrome in man (Down's syndrome, Turner's syndrome and Kleinfelter'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 **Hrs/Week: 2**
NMEC- II **Credits: 2**
Code: 20U4ZON02

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 **Hrs/Week: 2**
SBEC-II **Credits: 2**
Code: 20U4ZOS02

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) 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 **Hrs/Week: 3**
Core Practical - IV **Credits: 3**
Code: 20U4ZOCP04

GENETICS

Objectives:

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

Major

1. Identification of blood group.
2. Observation of common mutants of Drosophila
3. Preparation of mounting of the salivary gland in Drosophila larva
4. Isolation of DNA (Crude method).

Minor

1. Mounting of buccal epithelial cells to study Barr body.
2. Karyotype (Demo).
3. Preparation and analysis of pedigree charts.
4. Study of dominant and recessive traits among students (Thumb and ear lobe)

SPOTTERS

1. DNA
2. RNA
3. tRNA
4. Down syndrome
5. Turner syndrome
6. Klinefelter syndrome
7. Blood grouping kit
8. Monohybrid
9. Dihybrid
10. Test cross

B.Sc. ZOOLOGY

Semester- V **Hrs/Week: 5**

Core Paper- V **Credits: 5**
Code: 20U5ZOC05

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

Origin of life - Abiogenesis, Biogenesis, Cosmozoic theory, Theories of organic evolution, Biochemical origin of life, Urey and Miller's Experiment.

UNIT: II

Evidences - Morphology and Comparative anatomy, Embryological, Physiology & Biochemical, Paleontological evidences. Geological time scale.

UNIT: III

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

UNIT: IV

Elemental Forces of Evolution – Mutation, Recombination, Hybridization, Isolation & Isolating Mechanisms, Natural Selection & its types, Founder Principle, and Genetic Drift. Hardy Weinberg law, Speciation & its types, Evolution of Man & Horse.

UNIT: V

Patterns of Evolution – Sequential, Divergent, Microevolution, Macroevolution, Megaevolution, Quantum and Coevolution. Mimicry and Colouration – types, Adaptive Radiation – causes & types.

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- V **Hrs/Week: 5**
Core Paper- VI **Credits: 5**
Code: 20U5ZOC06

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 - Based on quantity of yolk, Distribution of yolk in cytoplasm, Cleidoic & Non Cleidoic egg

UNIT: II

Fertilization – Definition, Types, Mechanism of fertilization & their significance Parthenogenesis – Types & their significance**.** Fate map of frog

UNIT: III

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

UNIT: IV

Organogenesis - Development of eye, heart and brain in frog. Placenta – Structure and types with suitable example. Extra embryonic membranes and their functions.

UNIT: V

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

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 **Hrs/Week: 5**
Core Paper- VII **Credits:4**
Code: 20U5ZOC07

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 of microbiology- Contribution of Louis Pasteur, Robert Koch, Alexander flaming & Edward Jenner - Whittaker's five kingdom concept –. Basic structure and salient features of – Virus, Bacteria, Fungi. Gram staining: Gram negative, Positive bacteria.

UNIT: II MICROBIAL CULTURE

Methods of bacterial growth, Growth curve, Types of Sterilization, Medium Preparation - Types of culture media, Nutritional requirements, Methods of culturing bacteria (Broth, Agar Plate, Agar slant, Agar Stab, Roll tube, Deep media), Gram staining technique, Maintenance of bacterial culture.

UNIT: III MICROBES AND DISEASES

Microbial disease of man (Geographical distribution – Epidemiology-pathogenesis). Bacterial disease –TB, Typhoid. Viral disease – SARS-CoV-2. , AIDS. Fungal disease - Aspergillosis, Candidiasis

UNIT: IV IMMUNE SYSTEM:

introduction and types of immunity, Innate immunity- factors involved in innate immunity, active and passive acquired immunity. Lymphoid System – Primary and Secondary lymphoid organs 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 – salient features and detection, Classical and Alternative pathways. Immunization schedule & COVID Vaccine.

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., Harly, J.P. and Ulein, B.A. (2004) Microbiolgy (IV Edi). WMC, Broun Publisher, USA.
4. Pelczar, M.J. (2002) Microbiology, McGraw-Hill Education India Ltd., New Delhi.

B.Sc. ZOOLOGY

Semester- V **Hrs/Week: 5**
Elective- I **Credits: 3**
Code: 20U5ZOE01

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

Branches and Scope of Biotechnology, Genetic Engineering – Concept, application & Tools of Genetic Engineering (Enzymes : Restriction enzyme, DNA Ligases; Vectors – Plasmid & Cosmids), PCR- Mechanism, variation and applications.

UNIT: II

Methods of Gene transfer – Transformation, Transduction, Microinjection, Electrophoration, Gene Gun Method & Liposome mediated gene transfer methods. ELISA, Blotting techniques – Southern, Northern and Western.

UNIT: III

Gene therapy methods – Germ line and Somatic cell gene therapy, Monoclonal antibodies (MCAs) – Production of Hybridoma Clones. Human genome project.

UNIT: IV

Principle of fermentation - Fermentation process – Upstream, Down Stream – Applications of enzymes. Cryobiology – Cryopreservation techniques, Transgenic animal – Mice & Fish.

UNIT: V

Introduction to Nanotechnology, Properties and Application of Nanomaterials. Structural and Functional Regulation of DNA. Protein – Lipid Assembly and Biomimetic Nanostructures, Drug Nanoparticles, Liposomes and Hexosomes. Characterization- Nanoparticles for crossing biological membranes.

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 **Hrs/Week: 2**
SBEC- III **Credits: 2**
Code: 20U5ZOS03

SERICULTURE

Objectives:

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

UNIT: I

History and Scope of sericulture, Development of sericulture in India – Economic Importance of sericulture.

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 — sorting and deflossing, stifling and storage. Byproducts of silkworm, 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 **Hrs/Week: 2**
SBEC- IV **Credits: 2**
Code: 20U5ZOS04

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 & enemies of earthworms, 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. Types – Small scale and large scale production.

UNIT: V VERMICOMPOSTING, USES, POTENTIAL AND AGRICULTURE

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

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- V **Hrs/Week: 3**
Core Practical- V **Credits: 3**
Code- 20U5ZOCP05

EVOLUTION & DEVELOPMENTAL BIOLOGY

Objective:

- To gain the practical knowledge about the Developmental Biology & Evolution.
- To understand the uses of instruments
- To learn the different developmental stage of chick embryo.

Developmental Biology:

1. Mounting of Chick embryo.
2. Various stages of chick embryo (Permanent slide identification)
3. Sperm counting using hemocytometer (Cattle).
4. Motility of sperm using hanging drop method from the given sample (Cattle).
5. Sperm staining (Cattle).
6. Metamorphosis of frog.
7. Regeneration of frog tadpole tail.

Evolution

1. Homologous and Analogous organs (Explain with specimen or picture)
2. Evolutionary significance of Darwin's Finches.
3. Connecting links – Trilobite, Peripatus and Arecheopteryx.
4. Evolution of man.
5. Visit to Museum and report submission.

Spotters:

1. Sperm
2. Ovum
3. Early cleavage 2 & 4 cell stage
4. Yolk plug stage
5. Blastula
6. Gastrula
7. Placenta
8. Homologous and analogous organs
9. Darwin's Finches
10. Any three fossils

B.Sc. ZOOLOGY

Semester- V **Hrs/Week: 3**
Core Practical-VI **Credits: 2**
Subject Code- 20U5ZOCP06

MICROBIOLOGY & IMMUNOLOGY

Objective:

- To gain the practical knowledge about the Microbiology And Immunology

Microbiology

1. Bacterial Culture techniques – Streak plate, Pour plate.
2. Simple staining and Gram's staining.
3. Mounting of Bread mold.
4. Quality analysis of milk using Methylene Blue Reduction test (MBRT).
5. Isolation of bacteria from soil sample.

Immunology

1. Antigen - Antibody reaction (Agglutination).
2. Preparation of lymphocytes from peripheral blood by density gradient centrifugation.
3. Immuno electrophoresis (Demo).

Spotters

1. Inoculation loop
2. L – rod
3. Petriplate
4. Autoclave
5. Laminar air flow
6. Hot Air Oven
7. Incubator
8. Culture Media
9. Chemosterilants (Chemicals)
10. Antiserum A and B
11. Electrophoresis parts

B.Sc. ZOOLOGY

Semester- VI **Hrs/Week: 5**
Core Paper- VIII **Credits: 5**
Code: 20U6ZOC08

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. Absorption and assimilation.

UNIT: II

Respiration: Types of respiration and respiratory pigments. –Structure of hemoglobin – Transport of respiratory gases – Oxygen transport and Oxygen disassociation curve – Carbon-di-oxide transport – Chloride shift - Hb buffer system. **Circulation:** Neurogenic and Myogenic hearts. Composition of blood – Blood clotting – Heart beat – origin and 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, overies and Gastrointestinal hormones.

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- VI **Hrs/Week: 5**
Core Paper- IX **Credits: 5**
Code: 20U6ZOC09 **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 - 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: Population Ecology–definition and Characteristics of Population.
Community: Community Ecology- Definition and Characteristics of community.

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 and thermal pollution) 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, Frentice Hall of India, New Delhi
4. Odum, E.P. (2003) Fundamentals of Ecology, Holt Saunders, Philadelphia.

B.Sc. ZOOLOGY

Semester- VI **Hrs/Week: 5**
Core Paper- X **Credits: 4**
Code: 20U6ZOC10

WILD LIFE BIOLOGY

Course Objectives:

To acquire knowledge on basic principles and applications of Wildlife biology

UNIT - I: IMPORTANCE OF WILDLIFE IN INDIA

Definition of Wildlife: Causes of wildlife depletion; Economic importance of wildlife; need for wildlife conservation; rare, endangered, threatened and endemic species.

UNIT - II: FOREST ENTOMOLOGY

Harmful Insects and their role in forest economy: Insect pests of important trees of India - Teak, Sal and Bamboo; Beneficial Insects and their role in forest economy: Scavenger insects, Pollinators, Predatory insects.

UNIT - III: BEHAVIOUR OF WILDLIFE

Instinctive behavior- classical and modern concepts-fixed action pattern and ritualization; Learning-Imprinting-habituation. Analysis of behaviour pattern- taxis, kinesis and reflexes; Biological rhythms and bird migration.

UNIT - IV: WILDLIFE TECHNIQUES

Vegetative analyses – Point Centered Quadrat, Quadrat, Strip transect; GIS and Remote sensing in wildlife habitat surveys - Habitat manipulation: food, water, shade improvement; impact and removal of invasive alien species; Making observations and records: field notes, datasheets;

UNIT - V: WILDLIFE CENSUS TECHNIQUES

Planning census – Basic concepts and applications - Direct & Indirect count (Call count, track and signs, pellet count, pugmark, camera trap) - Identifying animals based on indirect signs; Capture-recapture techniques.

Reference Book

1. Rodgers, W.A 1991. Techniques for Wildlife census in India – A Field manual technical Manual – Wildlife Institute of India, Dehra Dun.
2. Sukumar. R. 1989. Ecology and management of Asian elephants. Oxford University Press.
3. Handbook of Tropical Estuarine Biology by S.Z, Qasim, 2004.

B.Sc. ZOOLOGY

Semester- VI **Hrs/Week: 4**
Elective- II **Credits:3**
Code- 20U6ZOE02

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 pyrmidines. 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) Fundementals 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- 20U6ZOS05 **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. Upadhya, 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 **Hrs/Week: 2**
SBEC -VI **Credits: 2**
Code- 20U6ZOS06

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. Chakrabarthi, 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 **Hrs/Week: 3**
Core Practical-VII **Credits: 2**
Code- 20U6ZOCP07

ECOLOGY & WILD LIFE BIOLOGY

Objective:

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

Major

1. Estimation of dissolved oxygen content in given water sample (Wrinkler's Method).
2. Estimation of corbandioxide (CO_2) in water samples.
3. Estimation of salinity in the given water sample.
4. Estimation of carbonates and bicarbonates in water samples.

Minor

1. Examination of intertidal fauna of rocky shore sandy shore and muddy shore.
2. Study of pond ecosystem.
3. Mounting of plankton (any two).
4. Field visit and report submission.

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. Endangered animals of India (any three).

B.Sc. ZOOLOGY

Semester- VI **Hrs/Week: 3**
Core Practical-VIII **Credits:2**
Code- 20U6ZOCP08

ANIMAL PHYSIOLOGY

Objective:

- To gain the practical knowledge about the Animal Physiology

Major

1. Estimation of oxygen consumption in fish.
2. Qualitative analysis of Carbohydrates.
3. Qualitative analysis of Protein.
4. Qualitative analysis of Lipids.

Minor

1. Qualitative analysis of excretory products (Urea, Uric acid and Ammonia).
2. Effect of temperature on salivary amylase activity
3. Estimation of hemoglobin.
4. Preparation of Haemin crystals.

Spotters:

1. Haemoglobinometer.
2. Kymograph
3. Spigmomanometer
4. BP apparatus (Digital)
5. Sahli's apparatus
6. Thermometer
7. Adrenal gland
8. Thyroid gland
9. Islets of Langerhan's (Pancrease TS)
10. Muscles – Skeletal, Smooth and Cardiac muscle.