POOMPUHAR COLLEGE (AUTONOMOUS)

(*Of the Tamil Nadu H.R & C.E Department*)

(*Accredited B^+ by NAAC*)

MELAIYUR 609 107

B.SC., SYLLABUS

(FROM THE ACADEMIC YEAR 2019- 2020 ONWARDS)

PG AND RESEARCH DEPARTMENT OF ZOOLOGY

POOMPUHAR COLLEGE (AUTONOMOUS)
Of the Tamil Nadu H.R & C.E DepartmentMELAIYUR 609 107
PG AND RESEARCH DEPARTMENT OF ZOOLOGY
UG BOARD OF STUDIES – ZOOLOGY

1. **Dr. J. Gokulakrishnan** - Chairman
   Assistant Professor and
   Head of the Department of zoology
2. **Dr.A. Maharajan** - Vice Chancellor Nominee
   Assistant professor of zoology
   KhadirMohideen College
   Adirampattinam
3. **Dr.V. Aldous. J. Huxley** - Academic Council Nominee
   Assistant professor of zoology
   THIRU. VI. KA Govt. Arts College
   Thiruvarur
4. **Dr.M. Baskaran** - Graduate Alumnus
   Assistant professor of zoology
   A.V.C. College (Autonomous)
   Mayiladuthurai
5. **Dr. S. Lakshmanan** - Member
   Assistant Professor of Zoology
6. **Dr. M. Nalini** - Member
   Assistant Professor of Zoology
7. **Dr. R. Subramanian** - Member
   Assistant Professor of Zoology
8. **Dr. M. Sangeetha** - Member
   Assistant Professor of Zoology
9. **Dr. B. Kavithabharathi** - Member
   Assistant Professor of Zoology
10. **Dr. P. Sivakumar** - Member
    Assistant Professor of Zoology
11. **Dr. T. Senthamilselvi** - Member
    Assistant Professor of Zoology
12. **Dr.Baluselvakumar** - Member
Assistant Professor of Zoology
13. **Thiru. K. Elanchezhiyan** - Member
    Assistant Professor of Zoology

POOMPUHAR COLLEGE (AUTONOMOUS)
(H R & C E Admin. Dept. Tamil Nadu)
MELAIYUR-609107
PG & Research Department of Zoology
B. Sc. Zoology - Course structure under CBCS

(Applicable to the candidates admitted from the academic year 2019 - 2020 onwards)

Semester	Subject	Hours	Credit	Exam	Marks		Total
					Internal	External	
I	Tamil - I	6	3	3	25	75	100
	English – I	6	3	3	25	75	100
	First Allied - I (Botany)	5	3	3	25	75	100
	First Allied - I (Botany Practical)	3	-	-	-	-	-
	Core - I (Invertebrata)	5	5	3	25	75	100
	Core - I (Practical Zoology)	3	-	-	-	-	-
	Value Education	2	2	3	25	75	100
		30	**16**			**500**	
II	Tamil – II	6	3	3	25	75	100
	English – II	6	3	3	25	75	100
	First Allied - II (Botany Practical)	3	4	3	40	60	100
	First Allied – II (Botany Theory)	5	3	3	25	75	100
	Core - II (Practical Zoology)	3	5	3	40	60	100
	Core - II (Chordata)	5	5	3	25	75	100
	Environmental studies	2	2	3	25	75	100
		30	**25**			**700**	

III	Tamil – III	6	3	3	25	75	100
	English – III	6	3	3	25	75	100
	Second Allied - II (Chemistry)	5	3	3	25	75	100
	Second Allied - II (Chemistry Practical)	3	-	-	-	-	-
	Core - III (Cell Biology & Biochemistry)	5	5	3	25	75	100
	Core - III (Practical Zoology)	3	-	-	-	-	-
	N M E - I Public Health and Hygiene	2	2	3	25	75	100
		30	**16**			**500**	
IV	Tamil – IV	6	3	3	25	75	100
	English – IV	6	3	3	25	75	100
	Second Allied - III (Chemistry Practical)	2	4	3	40	60	100
	Second Allied - III (Chemistry Theory)	5	3	3	25	75	100
	Core Major - IV (Practical : Cell Biology, Biochemistry & Animal Physiology)	2	5	3	40	60	100
	Core Major - IV Animal Physiology	5	5	3	25	75	100
	N M E - II Ornamental Fish Farming	2	2	3	25	75	100
	SBE - I Commercial Zoology	2	2	3	25	75	100
		30	**27**				**800**

V	Core -V Genetics	6	6	3	25	75	100
	Core – VI Ecology	6	6	3	25	75	100
	Core - VII Biotechnology	6	5	3	25	75	100
	Core - V (Practical: Genetics, Ecology & Biotechnology)	3	3	3	40	60	100
	MBE - I Economic Entomology	5	4	3	25	75	100
	SBE - II Bio-Instrumentation	2	2	3	25	75	100
	SBE - III Vector Biology & Parasitology	2	2	3	25	75	100
		30	**28**			**700**	
VI	Core - VIII Developmental Biology	6	5	3	25	75	100
	Core - IX Evolution	6	5	3	25	75	100
	Core - X Microbiology & Immunology	6	6	3	25	75	100
	Core - VI (Practical: Developmental Biology, Evolution , Microbiology & Immunology)	3	3	3	40	60	100
	MBE - II Aquaculture	6	5	3	25	75	100
	Soft Skill Development	2	2	3	25	75	100
	Gender Studies	1	1	3	25	75	100
	External Work	-	1	-	-	-	-
		30	**28**			**700**	
	TOTAL	**180**	**140**			**3900**	

Note:	**Internal Marks**	**External Marks**
1. Theory	25	75
Practical	40	60

2.

3. Separate passing minimum is prescribed for Internal and External marks.

The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)

The passing minimum for University Examination shall be 40% out of 75 marks (i.e. 30 Marks)

* For those who studied Tamil up to +2 (Result Stream)

** Syllabus for other Languages should be on par with Tamil at Degree level.

those who studied Tamil up to 10th or +2, but up to for other languages in degree level under part I should study special Tamil in Part IV.

Examination at the end of the next semester.

Extension activities shall be outside the instruction hours.

List of Allied Courses

Group – I (Any one)	**Group - II**
1. Chemistry	1. Botany
2. Physiological Chemistry / Basic Biochemistry	

Note: Either Group of Allied courses may be offered in the 1 year / II year.

nra;Kiwghlq;fs; cs;s ,iaGg; ghlq;fSf;F (4+2+4) ;jug;Gs;spfs;.

nra;Kiwghlq;fs; ,y;yhj ,iaGg; ghlq;fSf;F (3+3+4) jug;Gs;spfs;.

POOMPUHAR COLLEGE (AUTONOMOUS) MELAIYUR 609107

COURSE STRUCTURE FOR ALL UG DEGREE COURSES

(Applicable to the candidates admitted from the academic year 2019 - 2020 onwards)

PART	NAME OF PAPERS	NUMBER OF PAPERS	CREDITS
I	TAMIL	04	12
II	ENGLISH	04	12
III	CORE(including optional)	16	78
	FIRST ALLIED	03	10
	SECOND ALLIED	03	10
IV	NON MAJOR ELECTIVE	02	04
	SKILL BASED ELECTIVE	03	06
	VALUE EDUCATION	01	02
	ENVIRONMENTAL STUDIES	01	02
	SOFT SKILLS	01	02
	GENDER STUDIES	01	01
V	EXTERNAL WORK	--	01
	TOTAL	**39**	**140**

Question paper pattern (for part I, II, III)

PART – A

Ten questions 10x2=20 marks

(Two questions from each unit – no choice)

PART – B

Five questions (either or type) 5x5=25 marks

(One question from each unit)

PART – C

Three questions out of five 3x10=30 marks

(One question from each unit)

Total 75 marks

Question paper pattern (for part IV only)

PART – A

Three questions (either or type) 3x10=30 marks

(One question from each unit)

PART – B

Three questions out of five 3x15=45marks

(Atleast One question from each unit,

Not more than two questions from each unit,

No unit shall be omitted) ---

Total 75marks

Programme Outcomes:

PO1: Disciplinary Knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

PO2: Critical Thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO3: Problem Solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's earning to real life situations.

PO4: Analytical & Scientific Reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints. Ability to analyse, interpret and draw conclusions from quantitative / qualitative data; and critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.

PO5: Self-directed & Lifelong Learning: Ability to work independently, identify and manage a project. Ability to acquire knowledge and skills, including "learning how to learn", through self-placed and self-directed learning aimed at personal development, meeting economic, social and cultural objectives.

Programme specific outcomes:

PSO1 – Placement: To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.

PSO 2 - Entrepreneur: To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations

PSO3 – Research and Development: Design and implement HR systems and practices grounded in researches that comply with employment laws, leading the organization towards growth and development.

PSO4 – Contribution to Business World: To produce employable, ethical and innovative professionals to sustain in the dynamic business world.

PSO 5 – Contribution to the Society: To contribute to the development of the society by collaborating with stakeholders for mutual benefit

CORE- I INVERTEBRATA

Objectives

1. To understand the taxonomy, relationship and evolution of animals.
2. To identify the animals of invertebrate phyla and to recognize their distinguishing features.
3. To appraise the diversity of animals in a phylogenic context.
4. To understand how different body designs solve biological problems related to physiological and environmental challenges.
5. To develop an appreciation for the role of invertebrates in biological communities, ecological interactions, and conservation problems

Unit I

Classification & Protozoa

Introduction to Protozoa & Animal kingdom – Systems of classification & nomenclature - levels of organization - Types of symmetry. General characters of Protozoa & classification (up to class) with examples.

Type study: Paramecium .

General topics: Protozoan parasites, Life cycle of Plasmodium, Locomotion & Nutrition in Protozoa.

Unit II

Porifera & Coelenterata

Characters & classification (up to class) of Porifera & Coelenterata with examples – Salient features of *Ctenophora*.

Type study: *Leucosolenia, Obelia* colony

General topics: Canal system in sponges, Polymorphism in Coelenterates, Diversity - Types of corals, structure of coral polyp & coral reefs.

Unit III

Platyhelminthes, Aschelminthes & Annelida

Characters & classification (up to class) of Platyhelminthes, Aschelminthes & Annelida with examples.

Type study: Liver fluke, *Ascaris, Megascolex*

General topics: Nematode parasites & their adaptations, Coelomoducts, Metamerism in Annelids, Filter feeding in Polychaetes.

Unit IV

Arthropoda

Characters & classification (up to class) of Arthropoda with examples. Brief descriptions on *Limulus* & Sacculina.

Type study: Prawn

General topics: Crustacean larvae, Mouth parts of Insects, Beneficial Insects, Salient features of Arachnids, Affinities of *Peripatus*.

Unit V

Mollusca & Echinodermata

Characters & classification (up to class) of Mollusca and Echinodermata with examples.

Type study: *Pila*, Starfish.

General topics: Torsion & de-torsion in Gastropods, Cephalopods as an advanced Mollusc. Economically important Molluscan and Echinoderm larvae.

Learning Outcome:

1. The learner will be able to understand the diversity and basic taxonomy of non-chordates.
2. The learner will get an idea on adaptation and importance of non-chordates.
3. The learner will be able to identify the animal at basic level.
4. The paper will give a strong observation skill and prompt him to think about its conservation, sustainable economic utilization and its potentials in technological prospects.

Books (Use latest Editions)

1. Edition. Holt Saunders International Edition.
2. Ekambaranatha Ayyar& T.N. Ananthakrishnan, *Manual of Zoology Vol – I , Part I & II*S. Viswanathan Pvt. Ltd. Chennai..
3. Kotpal RL, Agarwal SK & Khetarpal RP *Invertebrates*, Rastogi Publications, Meerut.
4. Jordan & Verma Invertebrate Zoology S. Chand & Co, New Delhi
5. Anderson TA, *Invertebrate Zoology*, Oxford University Press, New Delhi.
6. Barrington EJW, *Invertebrate Structure and Functions*. English Language Book Society.
7. Hyman LH, *The Invertebrates (6 vols).* McGraw-Hill Companies Inc. NY
8. Nair NC, Invertebrata&Chordata, Saras Publication Nagercoil.
9. Nair NC, Leelavathy S, Soundara Pandian N Murugan T & Arumugam N *A Text Book of Invertebrates*, Saras Publication Nagercoil.
10. Ebenezer J & and Sheeja BD *Outlines of five kingdoms of life*, Shine and Twinkle Publication, Nagercoil.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**M**	**M**	**M**
CO2	**S**	**S**	**M**	**M**	**M**
CO3	**S**	**S**	**S**	**S**	**M**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

CORE- III CHORDATA

Objectives

1. To understand the taxonomy, relationship and evolution of animals.
2. To identify the classes of vertebrate animals and recognize their distinguishing features.
3. To appraise the diversity of animals in a phylogenic context.
4. To understand how different body designs solve biological problems related to physiological and environmental challenges.
5. To develop an appreciation for the role of vertebrates in biological communities, ecological interactions, and conservation problems.

Unit I

Prochordates & Pisces

General characters and classification of Chordates (up to class) with examples.

Type Study: *Amphioxus*, *Scolidon*.

General topics: Affinities of Hemichordates, Retrogressive metamorphosis in Ascidian, Salient features of Cyclostomata, Accessory respiratory organs in fishes, Types of Fins and function, Migration of Fishes.

Unit II

Amphibians

Classification and characters-Amphibians (up to order with examples).

Type Study: Frog

General topics: Metamorphosis of Amphibian, Limbless Amphibians, Parental care in Amphibian, Paedomorphosis.

Unit III

Reptiles

Classification and characters of Reptiles (up to order with examples).

Type Study: *Calotes*

General topics: Identification of Poisonous and non-poisonous snakes – Poison apparatus and types of poison, Skull of Reptiles, Salient features of Chelonia & Crocodilia.

Unit IV

Aves

Classification and characters of Aves (up to order with examples). Type

Study: Pigeon.

General topics: Flightless Birds, Flight Adaptations in Birds, Feet and Beak modifications, Acoustics in Birds, Migration in Birds.

Unit V

Mammals

Classification and characters of Mammals (up to order with examples). Type Study: Rabbit

General topics: Diversity of Marsupials, Affinities of Prototheria, Aquatic mammals and adaptation, Dentition in Mammals, Adaptive radiation in Mammals.

Learning Outcome:

1. The learner will be able to understand the diversity and basic taxonomy of chordates.
2. The learner will get an idea of adaptation and importance of chordates.
3. The learner will be able to identify any vetebrate animal at basic level.
4. The paper will give a strong observation skill and prompt him to think about its conservation, sustainable economic utilisation and its potentials in technological prospects.

Books for references (Use latest Editions)

1. Arumugam N *Animal Diversity - Volume - 2 - Chordata*, Saras Publication, Nagercoil
2. Thangamani A, Prasannakumar S, Narayanan LM, Arumugam N *A Text Book of Chordates*, Saras Publication, Nagercoil.
3. EkambaranathaAyyar& T.N. Ananthakrishnan, *Manual of Zoology Vol – II*, S. Viswanathan Pvt. Ltd. Chennai..
4. KotpalRL *Mordern Text Book of Zoology Vertebrates*, Rastogi Publications, Meerut.
5. Young, J.Z. 1950. *Life of Vertebrates.* Clarendon Press, Oxford, UK.
6. Pough Harvey F, Christine M .Janis and John B. Heiser .2002. *Vertebrate Life*, Pearson Education Inc. New Delhi.
7. Verma PS, Chordate Zoology, S Chand Publishers, New Delhi

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**M**	**M**	**M**
CO2	**S**	**S**	**M**	**M**	**M**
CO3	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

CC II - PRACTICAL - I INVERTEBRATA & CHORDATA

Objectives:

1. To impart training on the techniques of dissecting invertebrate and chordate animals and to understand the various systems present in their body.
2. To demonstrate the technique of in-silico dissection of invertebrate and chordate animals.
3. To train the students to discriminate the various external body parts of invertebrates and chordates.
4. To observe the preserved animals in the museum (wet and dry) and to study their characteristic features.

Dissections: 1. Earthworm – Nervous systems 2. Cockroach / Prawn – Nervous system

Mountings: 1. Earthworm: Body setae, Penial setae

2. Cockroach: Mouthparts

3. Prawn: Appendages

Spotters: 1**. Protozoa** : Paramecium, Paramecium : Conjugation & Binary fission, Euglena

2**. Porifera :** Sponge gemmule, Sponge spicules, Sycon

3. **Coelenterata :** Obelia entire, Physalia, Porpita, Sea anemone, Aurelia, Madrepora, Fungia

4. **Platyhelminthes:** Liverfluke, Tapeworm, Scolex, Planaria

5. **Nematyhelminthes**: Ascaris (Male and female), Filarial worm, Enterobius

6. **Annelida :** Nereis, Nereis parapodium, Heteronereis, Cheatopterus, Sabella, Arenicola Leech, Trocophore larva.

7. **Arthropoda** : Prawn, Nauplius larva, Zoea Larva, Mysis larva, Balanus, Crab, Limulus, Bombyx mori, Honey bee, Lac insect, Peripatus, Scolependra, Scorpion, Spider.

8. **Mollusca :** Pila, Radula, Pearl oyster, Sepia, Chiton, Dentalium, Octopus.

9. **Echinodermata** : Starfish, Pedicellaria, Sea urchin, Bipinnaria larva, Aristotle's lantern, Sea urchin, Hiothurian, ophiuroid .

CHORDATA

Virtual Dissections:

Rat – Demonstration of Digestive, Arterial, Venous & Reproductive Systems.

Mountings: Placoid scales, Cycloid / ctenoid scales

Spotters:

1. **Prochordata:** Amphioxus, Ascidian Balanoglossus Tornaria larva

2. **Pisces:** Shark, Ray, Clarius, Echnies, Hippocampus Exocoetus, Gambusia, Carp

3. **Amphibian:** Alytes, Axolotl larva, Hyla, Salamander, Ichlyophis

4**. Reptilian** : Naja naja, viper, Draco, Chelonemydas

5. **Aves:** Pigeon, quill feather

6. **Mammalian :** Bat, Rabbit

7. **Dentition:** Rabbit, Dog & Man

8. **Osteology:** Pigeon - Synsacrum Rabbit – pectoral & pelvic girdles, forelimb & hind limb bones

Students be introduced to learning of dissections / anatomy adapting CDS / Web sources.

Record of Laboratory work shall be submitted at the time of practical Examination.

Learning outcome

1. The learner has hands on experience of dissecting invertebrates.
2. The learner will be able to understand the structural features of invertebrates.
3. The learner will be able able to assess the development of adaptive features of invertebrates.
4. The learner will be able able to compare the emergence of evolutionary traits in invertebrates.
5. The learner will be able correlate the divergence of characters from common ancestors.

Text/ Reference Books:

1. Verma, P.S. 2013. A Manual of Practical Zoology of Invertebrates, S. Chand & Company Ltd., New Delhi.
2. Vijayaraman. K and palanivel.K, 1997 Cheimurai Vilangial, chimeera Publications.
3. Amsath, A. 2013. Practical manual in Zoology. MMA Publications, Adirampattinam.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**M**	**S**	**M**
CO2	**S**	**S**	**M**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**M**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

CORE COURSE IV: CELL BIOLOGY & BIOCHEMISTRY

Objectives

1. To give an insight to the ultra-structure of cellular components.
2. To give an idea about the biochemistry.
3. To give a clear idea about how the basic metabolism occur inside the cell.

Unit I

Introductory Cytology

Cell theory - Prokaryotic and Eukaryotic cells. Cytological techniques: Fixation– Sectioning & Staining. Principle, Resolving power & uses of compound microscope, Confocal microscope and electron microscope. Cell Junctions – Ultra structure and functions of plasma membrane.

Unit II

Cell Organelles

Nucleus & Nucleolus. DNA structure and function - DNA Replication - Chromatin – Nucleosome. Chromosomes: – Structure, types, Giant chromosomes. Ultra structure and functions of Endoplasmic reticulum & Golgi body.

Unit III

Biochemistry& Cell cycle

Ultra structure and functions of Lysosomes, Centrosomes, Mitochondria. Glycolysis and Kreb's cycle. Electron transport chain and formation of ATP. Cell cycle - Mitosis, Meiosis and Interphase its regulation. Apotosis and Cancer.

Unit IV

Protein Synthesis

Types & role of RNA- Structure of t-RNA. Ultra structure, function and types of ribosome. Properties of Genetic code - Detailed study of Protein synthesis – Polysome – differences in eukaryotes – Short outline of post transcriptional modifications.

Unit V

Enzymes & Metabolism

Structure and Classification of Carbohydrates, Protein and lipids. Enzymes: mechanism of action – classification and factors influencing enzyme action – Enzyme Inhibition. Glycogenesis – Glycogenolysis, Gluconeogenesis and HMP shunt. Deamination and Transamination. Beta oxidation of fats.

Learning Outcome:

1. Students can can the structures and purposes of basic components of cells, especially biomolecules, membranes, and organelles.
2. Students will develop an idea how cellular components are used to generate and utilize energy in

cells.

3. Students will explain the cellular components underlying mitotic cell division.
4. Students will be able apply their knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes, or alterations of cell function brought about by mutation.

Books for reference (Use latest Editions)

1. Arumugam N, Cell Biology & Molecular Biology, Saras Publications, Nagercoil.
2. Arumugam N, Cell Biology, Saras Publications, Nagercoil.
3. De Robertis EDP & De Robertis EMF, Cell and Molecular Biology, Lippincott Williams & Wilkins.
4. Fatima D , Narayanan LM , Meyyan RP, Nallasingam K, Prasannakumar S, Arumugam N. Biochemistry, Saras Publication, Nagercoil**.**
5. Gupta PK, Cell Biology, Rastogi Publications, Meerut.
6. Jain JL, Jain N & Jain S, Fundamentals of Biochemistry, S. Chand Publications, New Delhi.
7. Pawar CB, Cell Biology, Himalaya Publications.
8. Ramadevi K, AmbikaShanmugam's Fundamentals of Biochemistry for Medical Students, Lippincott Williams & Wilkins
9. Verma PS & Aggarwal VK Cell Biology S. Chand Publishers, New Delhi.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**M**	**M**
CO2	**S**	**S**	**S**	**M**	**M**
CO3	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

NON-MAJOR ELECTIVE -I
PUBLIC HEALTH AND HYGIENE

Objectives:

1. To impart awareness on public health, Hygiene and diseases.
2. To educate and emphasize on preventive measures of diseases.
3. To create knowledge on Health Education.
4. To explain why having good personal hygiene is important.
5. To list and discuss how to have good personal hygiene.

UNIT I

Scope of Public health and Hygiene – nutrition and health – classification of foods – Nutritional deficiency diseases- Vitamin deficiency diseases. Health Education in India – WHO Programmes – Government and Voluntary Organizations and their health services

UNIT II

Communicable diseases and their preventive and control measures. Measles, Tuberculosis, Malaria, Hepatitis, Cholera, Filariasis, Swine flu, HIV /AIDS.

UNIT III

Non-Communicable diseases and their preventive measures. Cancer, Cardio vascular diseases, Chronic Respiratory disease, Diabetes, Epilepsy.

Text Books:

1. Park and Park, 1995: Text Book of Preventive and Social Medicine – Banarsidas Bhanot Publ. Jodhpur– India.

Learning OutComes

1. To be able to understand Scope of Public Health and Hygiene - Nutrition and health - classification of foods.
2. **To** be able to understand Environment and Health Hazards
3. To be able to understand Communicable diseases and their control measures
4. To acquire the knowledge about Non - communicable diseases and their preventive measures
5. The student will acquire the knowledge about Health Education and Health programmes in India and WHO programmes.

Reference Books:

1. Verma, S. 1998 : Medical Zoology, Rastogi publ. – Meerut – India
2. Singh, H.S. and Rastogi, P. 2009 : Parasitology, Rastogi Publ. India.
3. Dubey, R.C and Maheswari, D.K. 2007 : Text Book of Microbiology- S. Chand & Co. Publ. New Delhi, India.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**S**	**M**
CO2	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**S**	**M**	**M**
CO4	**S**	**S**	**S**	**S**	**M**
CO5	**S**	**S**	**S**	**M**	**M**

S – Strong; M – Medium; L-Low

Core – III & IV Practical: Cell Biology & Biochemistry and Animal Physiology

Objectives:
To impart training on the techniques of physiological concepts in vertebrate animalsand to understand molecular structures, genetical importance and evolutionarysignificance. To train the students about bacterial cells and culture techniques.

Cell Biology& Bio Chemistry

1. Onion root tip-squash preparation and study of mitosis.
2. Grasshopper testis-squash preparation and study of meiosis.
3. Chironomous larva squash preparation of Giant Chromosome
4. pH measurement of various biological samples.

Spotters:
Columnar , Ciliated, Squamous Epithelium, Cardiac, Striated, Non-Striated Muscles, Nerve Cells, blood of man and frog. Common Microscope, Centrifuge, Micrometer, Camera Lucida.
Models of Hemoglobin, Amino acids and ATP, Diet chart

Animal Physiology
1. Qualitative and quantitative tests for proteins.
2. Qualitative tests for carbohydrates and fats.
3. Human salivary amylase activity in relation to temperature and pH.
4. Identification of nitrogenous waste products
5. Enumeration of RBCs/WBCs by haemoglobinometer

Spotters:
Haemoglobinometer, Kymograph, Sphygmomanometer.
Models of Steroids.

Learning outcomes
1.Students will learn the practical knowledge about principle and working procedure of microscope.
2.Identify various stages of cell divisions and giant chromosome structure.
3.The student will be able to understand experimental physiology

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	S	S	S
CO3	S	S	S	S	S
CO4	S	S	S	S	M
CO5	S	S	S	S	M

S – Strong; M – Medium; L-Low

CORE- IV ANIMAL PHYSIOLOGY

Objectives

1. To familiarize students with the principles and basic facts of Animal Physiology.
2. To give students an insight about the molecular and cellular basis of physiological functions in animals.
3. To give an idea about the regulation of organ system functions in a whole animal using a conceptual model of feedback to explain homeostasis.
4. To make an awareness to the students about how the structure-function relationships synchronies along with the molecular signals.

Unit I

Nutrition & Respiration

Nutrition: Digestion and absorption of carbohydrates proteins and lipids. Minerals & Vitamins – their deficiency. Hormonal control of digestion. Respiratory pigments- structure of haemoglobin, Transportation of gases - Bohr Effect - Regulation of respiration - bronchitis, asthma - Physiological effects of smoking.

Unit II

Circulation & Excretion

Blood- composition and functions, Mechanism of clotting. Types of Hearts – Heartbeat & pace maker – Cardiac cycle – ECG - Pulse and blood pressure. Nephron structure & mechanism of urine formation, -. Excretory products, Osmo-regulation in fishes.

Unit III

Muscle & Nerve Physiology

Types of muscles - Ultra structure of striated muscle, Muscle contraction & properties. Neurons – structure & types - Impulse propagation, synaptic transmission, neuro transmitters - Reflex action, Nerve disorders – epilepsy, Alzheimer's disease, Parkinson's disease.

Unit IV

Sense Organs

Structure of eye, physiology of vision, visual elements and pigments, photo chemistry of vision - Eye defects – myopia, hyperopia, presbyopia, astigmatism, cataract - Structure of ear and mechanism of hearing - Hearing impairments – deafness, labyrinthine disease - Olfactory, gustatory and tactile sense organs

Unit V

Reproductive Physiology

Physiology of human reproductive system. Endocrine glands in man - Hormones, action and disorders - Feed-back mechanism, Outlines of mechanism of hormonal activity, Puberty, adolescence, pregnancy, parturition, lactation and birth control.

Learning Outcome

1. The students will be able to explain how the various organ systems are coordinated and controlled.
2. The students will be able to list the functions of various organs in relation to physiological process.
3. The students will develop the idea of multilevel controlling and feedback mechanism in relation to various physiological functions.
4. The students will be able to understand the basic physiological process related to adaptation, metabolism and major requirements.

Books for reference (Use latest Editions)

1. Arumugam N &.Mariakuttikan A Animal Physiology Saras Publications, Nagercoil.
2. Bhagavan NV, Medical biochemistry, fourth edition Academic Press.
3. Guyton AC, Hall JE, Text Book of Medical Physiology, Elsevier
4. Jain AK Textbook of Physiology. Avichal Publishing Company.
5. Lehninger AL, Michael Cox, Nelson DL, Biochemistry. Macmillan.
6. Tyagi BS, Agarwal VK &Verma PS Animal Physiology S. Chand Publishers, New Delhi.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**S**	**M**
CO2	**S**	**S**	**S**	**S**	**S**
CO3	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**S**	**M**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong;M – Medium;L-Low

NON-MAJOR ELECTIVE - II
ORNAMENTAL FISH FARMING

Objectives:

To enlighten the non-major elective students about ornamental fish farming a profitable culture practice. To help Arts students about this self-employment programme.

UNIT I

Importance and scope of ornamental fish culture - Economics. Commercial value and potential trends in ornamental fish farming in the world and in India. Budget required for setting up an Aquarium Fish Farm as a Cottage Industry.

UNIT II

Important freshwater ornamental fishes - Indigenous and exotic species- Guppy, Sword tail, Gold fish, Angel fish, Butterfly fish, Zebra fish, Molly, Gourami. Mass production of fancy fishes: Preparations for breeding – breeding behavior of chosen fishes- molly and fighter fish. Induced breeding. Food and feeding – Preparation and composition of formulated fish feeds. Live feeds.

UNIT III

Aquarium design, Construction and preparation- functions of Bio filters, aerators – accessories for fish Tanks – hood and light, nets, suction tube. General Aquarium maintenance – Maintenance of water quality. Live fish transport- Fish handling, packing and forwarding techniques. Disease management: Common bacterial, viral, fungal, protozoan and crustacean infections, their treatment and control.

Text Books:

1. Santhanam, R., N. Sugumaran and P. Natarajan. 1987. A manual of Freshwater aquaculture. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Shanmugam, K. 1992. Fishery Biology and Aquaculture. Leo Pathipagam, Madras.

Learning Outcome

The student will be able to understand the basic knowledge of Aquarium fish keeping.
The students will be able to know how to maintain an aquarium .
The student will be able get knowledge about different varieties of ornamental fish.
The student will be able to acquire knowledge about disease management in aquarium fishculture.
The students will acquire knowledge about the feeding techniques of aquarium fishes

Reference Books:

1. Jameson, J.D. and R.Santhanam (1996). Manual of ornamental fisheries and farming technology. Fisheries College and Research Institute, Thoothukudi.

2. Mitchell Beazley, 1998. The complete guide to tropical aquarium fish care. Read and Consumes BookLtd., London.
3. Jingran V.G., 1991: Fish and Fisheries in India – Hindustan Publ. Co. New Delhi – India.
4. Mill Dick, 1993: Aquarium Fish, DK Publ. Co. Inc. New York – USA.
5. Day, F, 1978: Fishes of India Vol. I & II, William Danisan & Sons, India. Gupta, S.K and Gupta, P.C. 2006. General and Applied Ichthyology. S. Chand and company Ltd. New Delhi.
6. Mitchell Beazley, 1998. The complete guide to tropical aquarium fish care. Read and Consumes Book Ltd., London.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**M**	**M**
CO2	**S**	**S**	**S**	**M**	**S**
CO3	**S**	**S**	**S**	**M**	**S**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

SBE I: COMMERCIAL ZOOLOGY

Objectives

To learn the importance of vermiculture and Apiculture
To learn the importance of aquaculture and vermicomposting
To learn the Common practices in Sericulture and ornamental fish culture

UNIT – I

Vermicuture: Vermicomposting, types of earthworm, Method of composting – factors responsible for composting .

UNIT – II

Apiculture: Types of honey bee – bee colony - social life in honey bees-types of beehive and other accessories – use of honey.

UNIT –III

Sericulture: Silk worm, Bombyx mori – cultivation of mulberry plants – rearing of silk worms – silk production – composition and uses of silk.

UNIT – IV & V

Aquaculture-Finfish culture: Types of culture – general culture techniques – induced breeding – culture of edible fishes. Ornamental Fish Culture – Angel fish – fighter fish – Gold Fish – Gurami and Guppies.

Shellfish culture: Culture of prawn, types of culture, harvest. Pearl oyster culture.

Learning Outcome

Understanding the role of worm farming in modern farming,potential of vermicompost,maintaining health of the soil,economic importance of Vermiculture and role of Vermiculture in protecting the environment.
They could able to understand Techniques of induced breeding,Commercial culture of catla & cat fish
They could understand about area of poultry production including nutrition,health welfare and product quality
The students could able to learn the Future strategies for Livestock Development

Text Book:

1. Vasantharaj David. B. and Kumaraswamy. T, 1988. Elements of Economic Entomology. Popular Book Depot. Madras.
2. Pillay. T.V.R. 1995. Aquaculture, Principles and Practices Fishing. New Books survey. England.

Reference Books:

1. Biswas, T.D. and S. Kmukhrjee, Text book of soil science. Tata. McGraw Hill, 1994. New Delhi.
2. Agarwal S.C. 1994. A hand book of fish farming. Narendra publishing house, Delhi.
3. Axalrod. H. Immeris, C.W. Burgens, W.S. 1996. Exoitic. Tropical fishes. T.F.H. Publications U.S.A.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**M**	**M**
CO2	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium;L-Low

CORE -V GENETICS

Objectives

1. Students will learn the basic principles of inheritance at the molecular, cellular and organismal levels.
2. Students will understand causal relationships between molecule/cell level phenomena ("modern" genetics) and organism-level patterns of heredity ("classical" genetics).
3. Students will learn the mechanism of Mutation and will able to understand how mutations bring changes in an organism.

Unit I

Mendelian Genetics

Mendelian Laws of Inheritance –Test cross & Back Cross - Multiple alleles – Polygenic inheritance - Incomplete dominance – Co-dominance – Importance of drosophila in genetics – Culture methods - sex identification – Mutants of *Drosophila*.

Unit II

Linkage & Crossing Over

Epistasis, Lethal genes. Linkage in Drosophila, Crossing over - Mechanism and theories. Chromosomal maps& its construction. Chromosomal Aberrations,Gene Mutations– Physical & Chemical mutagens – DNA repair.

Unit III

Inheritance

Sex determination in animals –X linked & Y linked inheritance – Genic Balance theory - Barr bodies - Chromosomal variation & Nondisjunction – Euploidy, Aneuploidy, Monosomy, Trisomy (Klinefelter, Turner & Down syndromes)– Cytoplasmic inheritance.

Unit IV

Mutations

Sickle cell anemia,Inborn errors of Metabolism:Phenylketonuria –Alkaptonuria– Albinism. Pedigree Analysis, Eugenics, Euthenics, Genetic Counselling, Inbreeding and Out breeding

Unit V:

Modern Genetics

Concept of Gene: Cistron – split gene – promoter – repetitive DNA – Transposons.Bacterial genome-Transformation – Conjugation – F factor -Sexduction – Transduction –Generalised&Specialised - Plasmids. –Operon concept- Lac &trp operons (outlines).

Learning Outcome:

1. Students will be able to describe and apply the principles of Mendelian genetics.
2. Students will be able to describe the flow of genetic information from DNA to RNA to protein.
3. Students will be able to explain how genes are regulated.
4. The students will able to explain how mutation occur and how its role in adaptation and speciation.

Books for reference (Use latest Editions)

1. Gardner EJ Principles of genetics. London, UK, John Wiley & Sons, Inc..
2. Meyyan RP Fundamendals of Genetics, Saras Publication Nagercoil.
3. Primrose SB, Twyman R. Principles of gene manipulation and genomics. John Wiley & Sons; 2013 May 28.
4. Strickberger MW, Genetics, Pearson publishers.
5. Verma PS & Agarwal VK Genetics, S. Chand Publishers, New Delhi.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**M**	**M**	**L**
CO2	**S**	**S**	**M**	**M**	**M**
CO3	**S**	**S**	**S**	**S**	**M**
CO4	**S**	**S**	**S**	**S**	**M**
CO5	**S**	**S**	**S**	**M**	**M**

S – Strong; M – Medium; L-Low

CORE- VI ECOLOGY

Objectives

1. To develop awareness about the environment and the interaction of various components.
2. To understand about various ecosystems.
3. To make an awareness about various effects of pollution and its management.
4. To create an awareness about the biodiversity and need for its conservation.

Unit I

Ecological concepts

Concept of Ecosystem: structure & function. Abiotic factors and its ecological role –Soil, Light, Temperature, Water. Limiting factors. Concept of Species, Population dynamics and Growth curves - Population Ecology – Community Ecology.

Unit II

Nutrient cycles & Interactions

Biogeochemical cycles: Carbon, Sulphur, Nitrogen and Phosphorous. Food chain & web, Pyramids & Trophic levels -Energy flow. Animal relationships: - Mutualism, commensalism, parasitism, competition, predation.

Unit III

Habitat Ecology

Ecosystem: characteristic features, types and faunal adaptations in Freshwater (Lotic &lentic), Marine, estuarine, mangrove, tundra, Savanna, cave, forest and desert ecosystems, Ecotone& edge effect. Significance & Conservation of wetlands. Ecological succession, Ecological effects of dams, hydroelectric projects& Aquaculture.

Unit IV

Pollution

Types, causes, effects (with examples) & management of Land, Water, Air, Thermal & Pesticide pollution. Nuclear Hazards – Management of Solid waste, Plastic waste, Medical waste and e-waste.

Unit V

Conservation

Biodiversity – definition, loss & cause. IUCN, CITES & Brief out lines of Indian laws of conservation. Biodiversity hot spots in India. Indian Endangered species & conservation,

Community reserves, Sanctuaries, National parks and Tiger reserves in Tamilnadu. Afforestation & Deforestation. Human animal conflicts

Learning Outcome:

1. The students will be able to present an overview of diversity of life forms in an ecosystem, will be able to differ between Qualitative & Quantitative study.
2. The learner can correlate choice of habitat for organisms to Abiotic Factors, aspects of energy transfer and will be able to explain the necessity for and adaptations, providing examples.
3. The learner can understand the reasons and capable of managing pollution and after effects.
4. The learner will be able to understand the value & need of Biodiversity conservation

Books for references (Use latest Editions)

1. Arumugam N *Concepts of Ecology*, Saras Publication, Nagercoil.
2. Gupta PK, Cytology, Genetics & Evolution, Rastogi Publications, Meerut.
3. Verma PS, & Agarwal VK, *Environmental Biology: Principles of Ecology*, S Chand Publishers, New Delhi.
4. Sharma PD, *Elements of Ecology*, Rastogi Publications, Meerut.
5. Chapman JL & Reiss MJ, *Ecology: Principles and Applications*, Cambridge University Press, New Delhi.
6. Odum EP, *Fundamentals of Ecology*, W.B Saunders College Publishing, Philadelphia.
7. Arumugam N *Organic Evolution*, Saras Publication, Nagercoil.
8. Caughley G, Sinclair AR. Wildlife ecology and management. Blackwell Science.
9. Divan S, Rosencranz A. Environmental law and policy in India: Cases, materials and statutes. New Delhi: Oxford University Press.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**S**	**M**
CO2	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**S**	**S**	**M**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

CORE - VII BIOTECHNOLOGY

Objectives

1. The objective of this course is to give a firm foundation in the fundamentals of modern Molecular techniques.
2. The course will give an insight to the mechanism of Gene Expression and Regulation.
3. The course will give a nut shell idea of various protocols followed in Biotechnology in relation to animal science.

Unit I

Recombinant DNA technology

Scope of Biotechnology, Restriction endonuclease – sequence recognition. DNA Ligase. Identification & isolation of gene - Cloning vectors and recombination –. Screening of recombinant DNA. Application of recombinant DNA technology. Commercial production of Insulin. Human Genome Project.(HGP).

Unit II

Molecular Techniques

Methods to isolate DNA – PCR types, Principle & applications. Electrophoresis – types and Principle. Blotting – types & applications. DNA finger printing and its applications – RAPD – FISH- RFLP. DNA probes & diagnosis – Super bug (Oil pollution)

Unit III

Animal tissue culture

Applications – Primary culture. Steps involved in mammalian cell culture- *He la*&*WI38* cell lines – Maintenance of cell lines – Techniques and Application of organ culture. Animal cloning – Dolly.

Unit IV

Applications

Genetically modified Animals - Single cell Protein from microbes – Biofuels – Solid waste management – Liquid Waste Management – Biogas production - Biopesticides. Transgenic Animals (Fish, Mice, Sheep & Cow) & its significance .

Unit V

Enzyme Biotechnology

Microbial production & application of enzymes – Ribozymes- Artificial enzymes - Immobilization of enzymes methods and its application. Biosensors - Cryobiology – Methods of cryo-preservation.

Learning Outcome:

1. The course will give an idea about the various techniques used in modern biotechnology.
2. The course will give an insight to the current applications of biotechnology and advances in the different areas like medical, microbial, environmental, bioremediation, agricultural, animal and forensics.

3. The learner will be able to understand how microbes is used engineer various genes.
4. The students will be able to explain the general principles of generating genetically modified organisms and modern artificial methods in biotechnology.

Books for reference (Use latest Editions)

1. Brown TA. Gene cloning. London: Chapman & Hall; 1995.
2. Kumaresan V Biotechnology Saras Publication Nagercoil
3. Primrose SB, Twyman R. Principles of gene manipulation and genomics. John Wiley & Sons; 2013 May 28.
4. Robertis D. Cell and molecular biology. Lea &Febiger,U.S
5. Verma PS & Agarwal VK Genetic Engineering, S. Chand Publishers, New Delhi

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**M**	**S**	**S**	**S**	**S**
CO2	**S**	**S**	**S**	**S**	**S**
CO3	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

CORE-V PRACTICAL: ECOLOGY &GENETICS AND BIOTECHNOLOGY

Objectives

1. To impart training on the principles of genetics, the role of genes and their inheritance.
2. To emphasize the knowledge about certain phenotypic characters and geneic interactions.
3. To inculcate good laboratory practices in students and to train them about to basic patters of inheritance in organisms, emphasize the human genetic characters and disorders and understand the pedigree charts of various characters.
4. To understand the water: quality-portable or not.
5. To give students competent lab skills in Biotechnology

GENETICS

1. Drosophila – male and female identification, Mutant forms (from pictures), Genetic importance.
2. Observation of simple Mendelian traits in man.
3. Human Karyotypes : Down's, Klinefelters and Turner's syndrome.
4. Recording of Mendelian traits in humans.

Spotters:

Recording of Mendelian traits in Man, Blood grouping of man, Pedigree Analysis. Models: Monohybrid and Dihybrid crosses. Karyotypes of normal male and female. Klinefelter's syndrome, Turner's syndrome and Down's syndrome. Drosophila- Male and female identification, Genetic importance, Mutants (Wing, body colour, eye colour). Models for DNA, tRNA Structure and DNA replication.

ECOLOGY

1. Estimation of dissolved oxygen
2. Estimation of salinity
3. Estimation of Calcium.
4. Mounting and identification of plankton (fresh water / marine)

Spotters:

Animal association, Intertidal fauna, Secchi disc ,Maximum and minimum thermometer, Barometer, Lux meter. 5. Visit to a local polluted area – Solid waste / sewage treatment plant 6. Construction of a food web diagram based on a field visit. Biodiversity Field collection methods; Identification of common animals - Soil invertebrate diversity, diversity of birds and mammals in parks / botanical gardens, threats to local biodiversity – Field visit is compulsory.

BIOTECHNOLOGY

1. Isolation of genomic DNA and horizontal electrophoresis of DNA -demonstration only
2. Transgenic Plants - Observation from Pictures,

3. Transgenic Animals - Observation from Pictures,

   Spotters:

   Bio gas unit**.**

Learning outcome

1. Students will learn the practical knowledge about certain phenotypic characters.
2. Understand the mechanism of Inheritance of genes in organisms.
3. Identify the genetic disorders in man and gain the knowledge to construction of pedigree for the genetic characters.
4. Elaborate the environmental degradations
5. The student will be able to understand different biotechnological tools

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**M**	**S**	**M**
CO2	**S**	**S**	**M**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**M**
CO3	**S**	**S**	**S**	**S**	**S**
CO3	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

MAJOR-BASED ELECTIVE
ECONOMIC ENTOMOLOGY

Objectives:

To enlighten the students on beneficial and harmful insects, their biology, their nature of damage and their management measures. To teach our students about pests which attack our crops and their management measures.

UNIT I

Structure and salient features

Brief account of external morphology of head, thorax and abdomen; Classification and development (metamorphosis) of insects; Salient features (up to order) and economic important of Thysanura, Orthoptera, Odonata, Thysanoptera, Isoptera, Coleoptera, Lepidoptera, Hemiptera, Diptera, Hymenoptera, Dermaptera

UNIT II

Productive insects

Sericulture- Types of Silkworm, Life cycle and rearing of mulberry silkworm, *Bombyx mori*; Economic importance of silkworms Apiculture – Types of honey bees, Life cycle and culture methods, bee product and its economic importance Lac culture – Lac insect, *Laccifer lacca* - Life cycle, Lac processing, Lac products and Economic Importance.

UNIT III

Beneficial insects

Biological control agents – Characters and different between parasitoids and predators (common Indian insects); General characters and beneficial role of scavengers, pollinators, weed killers; Medicinal and Aesthetic value of insects; Insect as human food.

UNIT IV

Insects of medical importance

General account on Personal Pests (Lice, Fleas, Bedbugs, Ticks, Scabies mites), Housefly, Cockroach, Biting insects (Mosquitoes, Biting Midges, Sandflies, Black flies, Horse Flies, Stable flies), Major insect-born disease and their management; Recent development in Forensic entomology.

UNIT V

Pest management Components of pest control – physical, mechanical, cultural, chemical and biological control; Pesticide applicators; Pesticide poisoning and first aids; Banned pesticides; General Principles, advantages and disadvantages of Integrated Pest Management; Recent advances in pest control – sterilization techniques, liquid vaporizers, pheromones.

Text Books:

1. David, B.V.2001. Elements of Economic Entomology. Popular Book Depot, Chennai.
2. Fenemore, P.G. and Prakash, A. 2006. Applied Entomology. New Age International (P) Limited Publishers, New Delhi.

Reference Books:

1. Chapman, R. F. 1988. The Insects Structure and function. Cambridge University Press, U.K.
2. Kumar, A. and Nigam, P.M. 2003. Economic and Applied Entomology. Emkay Publications, Delhi.
3. Pedigo, L.P.2003. Entomology and pest management. Pearson Education (Singapore) Pvt. Ltd., Delhi.
4. Prakash, I and Mathur, R.P.1987. Management of Rodent Pests. ICAR, New Delhi.
5. Singh, R. and Sachan, G.C. 2004. Elements of Entomology. Rastogi Publications, Meerut.
6. Fitzwater, W.D. and Prakash, I. 1989. Handbook of vertebrate pest control. ICAR, New Delhi.
7. Ambrose, D.P. 2004.General Entomology. Kalyan Publishers, West Bengal.
8. Rathinasamy, T.K.1986. Medical Entomology. S Viswanathan and Co., Madras, India.

Learning Outcome:

Learner would understand basis of classification.
Learner would be able to understand the difference in the life cycles of insects
Learner would understand life processes of certain harmful insects
Learner would understand the various ecological importance of insects Learner would understand need for conservation of insects

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**M**	**M**
CO2	**S**	**S**	**S**	**S**	**S**
CO3	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**S**	**S**	**M**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

SKILL BASED ELECTIVE II BIO–INSTRUMENTATION

Objectives

Demonstrate an understanding of the biomedical instrumentation principles in aspects of device design and applications. • Apply these principles in the context of bioinstrumentation interactions with tissues, organs and human body to explain the measurement results and to develop the instrumentations.

UNIT – I

Principle, parts and applications of Balances (Physical, Digital, Monobalance), Centrifuge – Colorimeter, pH, Autoclave and Hot air oven.

UNIT – II

Incubator, Waterbath, PCR, Sterilization techniques, Preparation and use of Glassware's – selection and cleaning of Glassware, syringes and needles.

UNIT – III

Electrophoresis: Paper and Gel – Principles and application. Chromatography: Paper- TLC – GLC – principles and applications.

Learning outcome

1. An understanding of biomedical instrumentation principles in aspects of device design and applications.
2. An understanding of the techniques, skills and modern engineering tools necessary for engineering practice.
3. An ability to analyze contemporary bioinstrumentation studies to make connections and decisions based on their scientific merit.
4. An ability to communicate and function effectively on a multi-disciplinary team. 6. An ability to strengthen self-learning methods and organizational skills to enhance problem-solving abilities and efficiency.

References:

1. Instrumental methods of clinical analysis, Chatwal Anand, 2003.
2. Biophysical Chemistry, Upadhayay Nath, 2001.
3. Biophysical Chemistry, R.N.Roy, 2005.
4. Turk and Turk 1995. Ewt. Science, Samders Company.
5. Park and Park 2985. Social and preventive medicine, East West Publications, New Delhi.
6. Application of World Health Organization on Health and Diseases.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**M**	**M**
CO2	**S**	**S**	**S**	**S**	**S**
CO3	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

SKILL BASED ELECTIVE III VECTOR BIOLOGY AND PARASITOLOGY

Objectives

Identify insects based on morphological features

Take up jobs in vector control and public health departments

Take up integrated pest management activities

UNIT – I

Mosquitoes – Biology, Morphology, Life cycle difference between *Culex*, *Anopheles* – public health importance – control measures.

UNIT – II

Housefly – Biology, Morphology, Life Cycle – Diseases spread by Housefly – Public health importance – control measures.

UNIT – III

Fleas – Biology, Morphology, Life Cycle – Diseases spread by Fleas – Public health importance – control measures.

UNIT – IV

Protozoan and Human diseases, life cycle and Public health importance of Trypanosomiasis and Leishmeniasis.

UNIT – V

Platyhelminthes and human diseases, life cycle and public health importance of *Taenia solium* and Ascaris.

References:

1. Mike. W. Service – 2010. Medical entomology for students Cambridge University Press.
2. Rathinaswamy. G. K. 2006. A hand book of medical entomology and Elementary parasitology. S. Viswanathan printers Chennai

Learning outcome

To acquire Knowledge of the Classification of Arthropod Vector insects.

To study the life Cycles of Vector Insects.

To Learn Various Vector borne diseases - Transmission and Control Measures.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**S**	**S**
CO2	**S**	**M**	**M**	**M**	**S**
CO3	**S**	**M**	**S**	**M**	**M**
CO4	**S**	**M**	**S**	**S**	**M**
CO5	**S**	**M**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

CORE -VIII DEVELOPMENTAL BIOLOGY

Objectives

1. To make an awareness to the students about the theories, concepts and basics of Developmental Biology.
2. To provide students about the idea of sex cells, fertilization, cleavage, differentiation and development of organs.
3. To make an awareness of the induction, organizers and development of extra embryonic structures.
4. To provide adequate explanation to students about the late embryonic developments and post embryonic development and ageing.
5. To give an idea about teratogenesis, *in vitro* fertilization, stem cells and amniocentesis to the students.

Unit I

Gametes & Fertilization

Basic concepts of developmental biology: Structure & types of Spermatozoa, Mammalian egg - Egg membranes. Patterns of egg - Spermatogenesis – Oogenesis. Fertilization – mechanism, theories and significance – Parthenogenesis.

Unit II

Blastulation& Gastrulation

Cleavage - Planes & Patterns, Factors controlling cleavage - Fate map & its construction. Blastulation . Morphogenetic movements - Gastrulation of frog & chick.

Unit III

Organogenesis

Development of Brain, Eye and Heart in frog. Development of Nervous system in chick &Foetal membranes in chick. Placentation in Mammals. Development of Pro, Meso& Metanephric kidneys.

Unit IV

Applied Embryology

Organizer concept –Structure – mechanism of embryonic induction and competence. Nuclear transplantation - teratogenesis – Regeneration: types - events and factors. Embryonic stem cells & significance. Methods to culture embryo.

Unit V

Embryological Techniques

Ostrous, Menstrual cycle and menopause - Pregnancy – trimesters – development. *Erythroblastosis foetalis* -Twins – types. Infertility – causes - Test tube baby and Assisted Reproductive Technology – Embryo transfer – Amniocentesis.

Learning Outcome

1. The learner will be able to understand methodological approaches to the study of embryonic development and the characteristics of the principal experimental models.
2. The students will be able to identify embryonic structures in preparations, photographs and diagrams.
3. The students will be able to develop an idea, how to arrange sequences in developmental processes in order.
4. The learner will be able to understand the derivatives of embryonic structures.
5. The students will be attain a basic conceptual knowledge of the principal cellular mechanisms of development and identify the genetic and molecular elements that are involved.

Books for reference (Use latest Editions)

1. Arumugam NA Text Book of Embryology, Biotechnology Saras Publication Nagercoil.
2. Balnisky BI An Introduction to Embryology, W.B. Saunders and Co.
3. BerrilNJ,Kars G(1986). Developmental biology, McGrawHills
4. Gilbert SF (2010). Developmental Biology, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
5. Majumdar NN Vetebrate embryology; Tata McGraw-Hill, New Delhi.
6. Verma PS & Agarwal VK Chordate Embryology, S. Chand Publishers, New Delhi.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**S**	**M**
CO2	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**S**	**S**	**M**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

CORE- IX EVOLUTION

Objectives

1. To develop an idea of the adaptations and its significance in relation to evolution.
2. To make the students aware of how organic evolution occurred and how the various life forms come into existence.
3. To make the students aware of the historical periods during the evolution of earth and status of fauna during the particular age.
4. To develop an idea of the distribution of the various faunal components.
5. To develop an idea regarding the evolution of various vertebrate forms

Unit I

Evidences of Evolution

Origin of life: Abiogenesis, Biogenesis, Cosmic theory, Biochemical origin of life, Urey-Miller experiment. Evidences of evolution: Morphological & Anatomical, Embryological, Physiological & Biochemical and paleontological.

Unit II

Theories of Organic Evolution

Lamarkism, Neo Lamarkism, Darwinism, Neo Darwinism, Mutation theory& New version of mutation theory. Modern Synthetic theory of evolution. Natural selection ,Convergent & Divergent evolution.

Unit III:

Adaptation & Isolation

Adaptation –Colouration and Mimicry (types and significance) – Non adaptive traits – Neotony& Significance. Isolation - Mechanism& Speciation. Hardy -Weinberg Equilibrium - Genetic drift. Basic outlines of Molecular evolution.

Unit IV

Evolution of Higher forms

Evolutionary significance of Dipnoi – Origin of Amphibia – Golden age of Reptiles - Major types of Dinosaurs and reason for extinction, Affinities of Archaeopteryx, Outlines of evolution of Man and Horse.

Unit V

Animal Distribution

Zoogeographical regions – Palaearctic, Nearctic, Neotropical, Oriental, Australian and Ethiopian regions - their Climatic and faunal peculiarities. Wallace line, Discontinuous distribution - Continental Drift. Geological time scale (Up to periods for Paleozoic & Mesozoic era; up to epoch for Cenozoic era) .

Learning Outcome:

1. Students will be able to describe the history and development of evolutionary thought, list and describe the evidence for evolution and its required corollaries & mechanisms by which evolution occurs.
2. Students will be able to describe the history of life on earth.
3. Students will be able to explain how speciation occur and reasons for extinction.
4. Students can make knowledge of how major vertebrate forms evolved in the earth.

Books for references (Use latest Editions)

1. Verma PS, & Agarwal VK *Cell Biology, Genetics, Evolution and Ecology*, S Chand Publishers, New Delhi.
2. Gupta PK, Cytology, Genetics & Evolution, Rastogi Publications, Meerut.
3. Arumugam N *Organic Evolution*, Saras Publication, Nagercoil.
4. Barton NH, Briggs DEG, Eisen JA, Goldstein DB and Patel NH, *Evolution*. Cold Spring, Harbour Laboratory Press.
5. Hall BK &Hallgrimsson B, *Evolution*, Jones and Bartlett Publishers.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**S**	**M**
CO2	**S**	**S**	**S**	**S**	**M**
CO3	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

CORE - X MICROBIOLOGY & IMMUNOLOGY

Objectives

1. The course is intended to make an awareness of the students about the classification, diversity, organization, application and pathogenicity of the microorganisms existing the ecosystem.
2. The course will help the students to learn about the various microbial culture techniques and its handling.
3. The course will give an idea that how microbes are used in various industries for generation of various products related to day to day life.
4. The course will give an insight to the cellular components involved in the immunity.
5. The course will give an awareness of the mechanism, types and concepts regarding immune response.

Unit I

Introductory Microbiology

Scope of Microbiology. Characters and basic classification of Kingdom Monera and Fungi. Systematic position of Virus – classification - Structure of bacteriophage. Viroids and Prions. Ultra structure of *E. coli*. General structure of fungi.

Unit II

Bacterial culture

Sterilisation- Types of Culture medium – Culture of Bacteria –Bacterial growth and growth curve – factors influencing bacterial growth. Maintenance & Characteristics of colonies. Staining of bacteria, Bio-fermenters and its role in mass culture.

Unit III

Applied Microbiology

Control of Microbes: Preservation of Milk –Microbes in Food Spoilage. Culture of Yeast& economic importance. Microbial Nitrogen fixation - Stages – types and methods of fermentation & products. Basic concepts of Probiotics. Bacterial (Cholera, Typhoid), Viral (Rabies, HIV) & Fungal (Candidiasis, Dandruff) diseases in man.

Unit IV

Immunology

Scope of Immunology. Lymphoid organs & Cells of immune system - Types of Immunity – immune response – immunoglobulins – Structure of IgG, IgA, IgM, Ig Epitopes, Paratopes, Haptens& Adjuvants. Antigen- antibody reactions - T-Cell and B-Cell activation - Monoclonal antibodies.

Unit V

Basic concepts of major histocompatibility complex. - Basic properties and functions of Cytokines, Interferons and complement proteins. Types of hyper sensitivity. Concepts of autoimmunity and immunodeficiency – Vaccines& Immunisation.

Learning outcome

1. The students will be able to explain the taxonomy, diversity and general structure of micro-organisms.
2. They will develop knowledge about the culture, sterilization, handling, identification and assessing growth characters of microorganisms.
3. The students will develop knowledge about the general microbial techniques for isolation of pure cultures of bacteria, fungi and algae and will master the aseptic techniques to perform routine culture handling tasks safely and effectively.
4. The students will get idea about the microbial spoilage and the potentials in the usage of microbes in agriculture.
5. The students will develop an awareness about the various microbial diseases and the causative organisms.

Books for reference (Use latest Editions)

1. Dubey RC & Maheshwari DK, A Textbook of Microbiology, S. Chand Publishers, New Delhi.
2. Mani A, SelvarajA.M , Narayanan L.M , Arumugam A, Microbiology, Saras Publication, Nagercoil.
3. Pelczar MJ, Chan EC, Pelczar MF. Elements of microbiology. McGraw-Hill International Book Company.
4. Ryan KJ, Ray CG, editors. Sherris medical microbiology. McGraw-Hill Education.
5. Willey JM, Sherwood L, Woolverton CJ. Prescott's microbiology. Singapore: McGraw- Hill.
6. Abul Abbas Andrew H. Lichtman Basic Immunology, Saunders.
7. Delves PJ, Martin SJ, Burton DR, Roitt IM. Essential immunology. John Wiley & Sons.
8. Ramesh SR, Immunology, Mcgraw Higher Ed.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	M
CO2	S	S	S	S	M
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	M

S – Strong; M – Medium; L-Low

CORE-IV PRACTICAL: DEVELOPMENTAL BIOLOGY, EVOLUTION AND MICROBIOLOGY& IMMUNOLOGY

Objectives

To provide fundamental ecological principles that provides in-depth understanding of our natural world, the scientific basis for understanding how environmental systems work. Developmental Biology provides understanding of the processes of early embryonic development and developing embryos

1. **Developmental Biology:**

Frog /Bull – sperm motility, Blastoderm mounting in Chick (demonstration only)

Spotters: Sperm, T. S. of Mammalian ovary. Frog: Egg, cleavage, blastula, Yolk plug and tadpole tags Chick: Egg, Developmental stages - 24 hrs, 48 hrs, 72 hrs and 96 hrs. Sheep: Placenta Record of Laboratory work shall be submitted at the time of practical examination.

2. **Evolution:**

Spotters: Protective coloration -Leaf insects, Stick insects, Chameleon, Hippocampus, Pepper moth. Mimicry: Monarch and Viceroy butterfly. Quantum evolution; Bat, Pteropus

3. **Microbiology& Immunology**

1. Demonstration of sterilization procedure for culture media and equipment.
2. Preparation of culture media for microbes, serial dilution techniques (in groups)
3. Distribution of microbes in water (demonstration and observations.)
4. Fixing and gram staining of bacteria
5. Hanging drop preparation of Lactobacillus.
6. ABO Blood grouping based using antibodies, Rh blood typing & and its immunological significance.
7. Observation of lymphoid organs in rat.

Spotters: Laminar Air flow, Autoclave, Petri-dish, Inoculation loop. Record of Laboratory work shall be submitted at the time of practical examination.

Immuno-electrophoresis, Rocket immune-electrophoresis.

Learning outcome

1. The student will be able to understand experimental Developmental biology
2. Comparative analysis of blood smear preparations
3. Elaborate the environmental degradations.
4. Estimate the quality of water.
5. Methodological calculations of biological data.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**M**	**S**	**M**
CO2	**S**	**S**	**M**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**M**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**M**

S – Strong; M – Medium; L-Low

MAJOR BASED ELECTIVE –II
AQUACULTURE

Objectives

To acquire knowledge about the importants of aquaculture
To know the different types culture
To obtain knowledge about aquarium keeping
To gather information about mariculture
To learn the role of organizations involved in aquaculture

UNIT – I

Scope and importance of aquaculture - advantages of Aquaculture - production trends in the world and in India - over - exploitation of wild fish stocks. Basic Fish farm design: selection of site. Construction of ponds - nursery and rearing ponds.

UNIT – II

Cultivable species of Fish, Crustaceans, Molluscs and Algae. Selection of Species for Aquaculture. Types of culture: extensive, intensive and semi intensive Culture. Integrated farming. Advantages of monoculture , polyculture and monosex culture.

UNIT – III

Culture of Carp species, Pearl culture: Socio-economic and environmental problems. Freshwater Prawn culture and problems in Prawn culture. Potential for ornamental fish culture. Common species for ornamental Fish farming.

UNIT – IV

Fish diseases and its management: Common bacterial, viral, fungal, protozoan and crustacean diseases, their symptoms and treatment. Water quality maintenance. Importance and Composition of feeds; types of feed: wet and dry feeds.

UNIT – V

Marketing the products: Marketing the fish to local markets and for export. Fishery by –product. Harvesting and transport. Quality control and norms of MPEDA. Preservation and processing methods. Nutritive values of fish food.

Learning outcome

Master the theoretical and practical aspects of fisheries across different species
Apply the Aquaculture methods and procedures for higher studies and research
To take up jobs in Aquaculture farms
To analyze biological samples of Aquaculture ponds

References:

1. Arumugam.N. 2008. Aquaculture Saras Publications, Nagercoil.
2. Rath, R.K. (2000) Freshwater Aquaculture. Scientific Publishers, (India), PO. Box. 91, Jodhpur.
2. Jhingran, AVG (1991) Fish and Fisheries of India. Hindustan Publishing Co.
3. Baradach, JE, JH Ryther and WO Mc Larney (1972) Aquaculture.
4. The farming and Husbandry of Freshwater and Marine Organisms. Wiley Interscience, New York.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	S	M	M
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S – Strong; M – Medium; L-Low

ENVIRONMENTAL STUDIES
(Applicable to the candidates admitted from the Academic year 2019-20 onwards)

Objectives

To make the student aware of World Environmental System
To make the student aware of the fundamental Concepts and Principles of Ecosystem and energy flow

Unit-I

The Multidisciplinary nature of environmental studies. Definition, scope and importance. Need for public awareness. Natural Resources: Renewable and non-renewable resources: Forest resources: use and overexploitation, deforestation - Water resources: Use and over-utilization of surface and groundwater, floods, drought, dams benefits and problems. Mineral resources: Use and exploitation,
Environmental effects of extracting and using mineral resources. Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems.

Unit:-II

Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and Decomposers - Energy flow in the ecosystem Food chains, food webs and ecological pyramids. Types of ecosystem: Forest ecosystem, Grassland ecosystem, Aquatic ecosystems, (ponds, lakes, Rivers) Biodiversity and its conservation: Introduction – Definition: Genetic, species and ecosystem Diversity- - Value of biodiversity - India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity. Endangered and endemic species of India - Conservation of biodiversity

Unit-III

Social Issues and the Environment: Definition- Causes, effects and control measures of Air Pollution, Water Pollution, Soil Pollution, Noise pollution, Thermal Pollution, Nuclear hazards. Disaster management: floods, earthquake, cyclone and landslides. Water conservation- rainwater harvesting. Climate change, global warming, acid rain, ozone layer depletion. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Public awareness.

Learning outcome

Evaluate the present condition of environmental pollution
Understand the nature of the atmosphere
Aware of causes of pollution and precautionary measure

References:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Public Ltd Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt ltd, Ahamedabad – 380013, India, E-mail: mapin@icenet.net(R)
3. Brunner R.C. 1989, Hazardous Waste Incineration, McGraw Hill Inc 480 p
4. Clark R.S. Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P.Cooper, T.H.Gorhani E & Hepworth, M.T. 2001.
6. De A.K. Environmental Chemistry, Wiley Eastern Ltd
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford University, Press 473p.
9. Hawkins, R.E. Encyclopedia of India Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge University Press 1140 p.

11. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws Himalaya Pub. House, Delhi 284 p.
12. Mckinney, M.L. & Schoch R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition 639 p.
13. Mhaskar A.K. Matter Hazardous, Techno-Science Publications (TB)
14. Odum, E.P. 1971 Fundamentals of Ecology. W.B. Saunders Co. USA. 574 p

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**M**	**M**
CO2	**S**	**S**	**S**	**M**	**S**
CO3	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

ALLIED ZOOLOGY

ALLIED COURSE – I – BIOLOGY OF INVERTEBRATES AND CHORDATES

Objectives

To lean the principles of animal taxonomy

To learn the classification of animals upto orders

To learn the salient features and various systems of different phyla

Unit I

Classification of major Invertebrate phyla and phylum Chordates, up to classes with phylum and class characteristics, and diversity with suitable examples.

Unit II

Detailed study: Paramecium, Obelia, *Fasciola hepatica* and Earthworm.

Unit III

Detailed study of Prawn, Lamellidens and Sea star.

Unit IV

Detailed study of external features, digestive system, respiratory system, circulatory system, urinogenital system and brain of Shark, Frog and Calotes.

Unit V

Detailed study of external features, digestive system, respiratory system, circulatory system, urinogenital system and brain of Pigeon and Rabbit.

Learning outcomes

Identify a fauna based on morphological character

Identify poisonous and non- poisonous snakes, and extinct fauna

Distinguish primitive mammals

Understand origin of chordates

Reference:

1. Outlines of Zoology – M. Ekambaranatha Ayyar – Viswanathan Publications.

2. A Manual of Zoology, Vol 1 & 2 M.E.K.Ayyar - Viswanathan Publications.

3. Invertebrate Zoology – E.L. Jordan - S.Chand and Co.

4. Chordate Zoology – E.L. Jordan – S. Chand and Co.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**M**	**M**	**L**
CO2	**S**	**S**	**M**	**M**	**M**
CO3	**S**	**S**	**S**	**S**	**M**
CO4	**S**	**S**	**S**	**S**	**M**
CO5	**S**	**S**	**S**	**M**	**M**

S – Strong; M – Medium; L-Low

ALLIED COURSE I & II – ALLIED ZOOLOGY PRACTICAL

Objectives

1. To understand the taxonomy and relationship and evolution of animals.
2. To understand the systematic and functional morphology of various groups of Chordates.
3. To study their economic importance, affinities and adaptations.
4. To satisfy the learners with modern techniques of animal culture
5. To inculcate knowledge on useful animals to mankind

1. **Dissections Earthworm**:

   Nervous system Cockroach: Digestive system Nervous system Any Carp (Bony fish: General Anatomy
2. **Mountings:**

   Earthworm – Body and Penial setae. Cockroach and Honey Bee - Mouth Parts Shark - Placoid Scale Any carp - Cycloid or Ctenoid Scale
3. **Spotters:**

   Amoeba, Paramecium, Trypanosoma, Plasmodium, a simple sponge, Obelia colony, Sea anemone, Ascaris, Fasciola hepatica, *Taenia solium,* Planaria, Earthworm, Nereis, Leech, Prawn, Scorpion, Grass hopper, Fresh water mussel, Pila, Starfish Amphioxus, Shark, Catla, Frog, Salamander, Calotes, Turtle, Snake, Pigeon, Rat & Bat.
4. **Species of animals used in Culture**:

   vermiculture, apiculture, lac culture, sericulture, aquaculture and poultry farming.
5. **Products of Animals**:

   Honey, Bee's Wax, Lac, Silk, Cod liver oil, Pearl, eggs of different poultry birds, leather, wool.

Learning outcomes

To understand the diversity of chordates and their classification.

To identify the general characters, classification, phylum of Chordates.

To understand the morphology and their systems of various groups of Vertebrates.

To understand the modern farming potential of vermicompost, Honey, Silk, fish culture and poultry production

To understand the various useful animal products to mankind

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**M**	**S**	**M**
CO2	**S**	**S**	**M**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**M**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low

ALLIED COURSE II – ECONOMIC ZOOLOGY

Objectives

To learn the importance of vermiculture and Apiculture

To learn the importance of aquaculture and vermicomposting

To learn the Common practices in Sericulture and ornamental fish culture

Unit I

Vermiculture and composting – types of earthworm – rearing technology – management – economic importance – Composting.

Unit II

Apiculture – species of honey bees – Types of bee hives – Care and management – honey extraction – Nutritive and medicinal value of honey.

Unit III

Sericulture – Feeding habits of larvae – Life cycle of silkworm (*Bombyx mori*) - Economic importance of silkworm and silk.

Unit IV

Aquaculture – Construction of Pond – Management of a pond – Freshwater cultivable fishes – fish feed – induced breeding – Prawn culture – Fish diseases (Furnunculosis, Epizootic ulcerative syndrome (EUS) and Vibriosis.

Unit V

Poultry - Classification of fowls based on their uses. – Management (summer and winter management) – Poultry nutrition – Poultry diseases (Coccidiosis, New Castle, Fowl pox, Gumbaro, CAV and EDS) and their prevention and control measures – Poultry export strategy.

Learning Outcome

Understanding the role of worm farming in modern farming,potential of vermicompost,maintaining health of the soil,economic importance of Vermiculture and role of Vermiculture in protecting the environment.

They could able to understand Techniques of induced breeding,Commercial culture of catla & cat fish

They could understand about area of poultry production including nutrition,health welfare and product quality

The students could able to learn the Future strategies for Livestock Development

Reference:

1. G. S. Shukla and V. B. Upadhyay – Economic Zoology, Rastogi Publications.

2. J. Ahsan and S. P. Sinha – A hand book of Economic Zoology - S. Chand & Co.,

3. Sardar Singh – Bees Keeping in India.

4. Santhanam – Aquaculture

5. Ullal, S.R. and M. N. Narasimhanna – Central Silk Board, Government of India, Bombay.

6. Singh – Livestock and Poultry Production.

7. Manju Yada, 2003. Economic Zoology, Discovery Publishing House, New Delhi.

OUTCOME MAPPING

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**S**	**S**	**M**	**M**
CO2	**S**	**S**	**S**	**M**	**M**
CO3	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**

S – Strong; M – Medium; L-Low