

2022-2023

B.Sc., ZOOLOGY

Course Structure and Syllabus

(For the candidates admitted from the academic year 2022–2023 onwards)

CHOICE BASED CREDIT SYSTEM (CBCS)



HANTHAI HANS ROEVER COLLEGE (AUTONOMOUS)

(Approved by NAAC, Affiliated to Bharathidasan University)

ELAMBALUR, PERAMBALUR – 621 220



Thanthai Hans Roever College (Autonomous), Elambalur, Perambalur– 621 220
Bachelor of Zoology – UG Course Structure under CBCS
(For the candidates admitted from the academic year 2022–2023 onwards)

Semester	Part	Subject Code	Course Title	Ins. Hours/ Weeks	Credits	Exam Hours	CIA (Max)	ESE (Max)	Total (Max)
1	I	22UT1/22UH1	Language–I	6	3	3	25	75	100
1	II	22UE1	English –I (Communicative English–I)	6	3	3	25	75	100
1	III	22UZO1CC1	Invertebrata	6	6	3	25	75	100
1	III	22UZO2CP1	Invertebrata& Chordata (P)	3	–	–	–	–	–
1	III	22UBO1AC1	Botany I	4	4	3	25	75	100
1	III	22UBO2AP1	Botany I (P)	3	–	–	–	–	–
1	IV	22UVE	Value Education	2	2	3	25	75	100
			Total	30	18				500
2	I	22UT2 / 22UH2	Language–I	6	3	3	25	75	100
2	II	22UE2	English –II (Communicative English–II)	6	3	3	25	75	100
2	III	22UZO2CC2	Chordata	6	6	3	25	75	100
2	III	22UZO2CP1	Invertebrata& Chordata (P)	3	3	3	40	60	100
2	III	22UBO2AC2	Botany II	4	4	3	25	75	100
2	III	22UBO2AP1	Botany I & II (P)	3	3	3	40	60	100
2	IV	22UES	Environmental Studies	2	2	3	25	75	100
			Total	30	24				700
3	I	22UT3 / 22UH3	Language–I	6	3	3	25	75	100
3	II	22UE3	English –III (Language Through Literature and Communicative Skills–I)	6	3	3	25	75	100
3	III	22UZO3CC3	Cell and Molecular Biology	6	5	3	25	75	100
3	III	22UZO4CP2	Cell and Molecular Biology & Genetics (P)	3	–	–	–	–	–
3	III	22UCH3AC3	Chemistry I	4	4	3	25	75	100
3	III	22UCH3AP2	Chemistry (P)	3	–	–	–	–	–
3	IV		NME1	2	2	3	25	75	100
			Total	30	17				500
4	I	22UT4 / 22UH4	Language–I	6	3	3	25	75	100

4	II	22UE4	English – IV (Language Through Literature and Communicative Skills–II)	6	3	3	25	75	100
4	III	22UZO4CC4	Genetics	4	4	3	25	75	100
4	III	22UZO4CP2	Cell and Molecular Biology & Genetics (P)	3	3	3	40	60	100
4	III	22UCH4AC4	Chemistry II	4	4	3	25	75	100
4	III	22UCH4AP2	Chemistry (P)	3	3	3	40	60	100
4	III		NME2	2	2	3	25	75	100
4	IV	22UZO4SBE1:1 22UZO4SBE1:2 22UZO4SBE1:3	Ornamental fish farming Sericulture Medical Lab technology	2	2	3	25	75	100
			Total	30	24				800
5	III	22UZO5CC5	Animal Physiology	5	5	3	25	75	100
5	III	22UZO5CC6	Immunology	5	5	3	25	75	100
5	III	22UZO5CC7	Environmental Biology	5	5	3	25	75	100
5	III	22UZO5CP5	Animal physiology, Immunology & Environmental Biology (P)	4	4	3	40	60	100
5	III	22UZO5MBE1:1 22UZO5MBE1:2 22UZO5MBE1:3	Economic Entomology Wild life conservation and Management Food and Nutrition	5	5	3	25	75	100
5	IV	22UZO5SBE2:1 22UZO5SBE2:2 22UZO5SBE2:3	Apiculture Vermi technology Aquaculture	2	2	3	25	75	100
5	IV	22UZO5SBE3:1 22UZO5SBE3:2 22UZO5SBE3:3	Health education Poultry farming Dairy technology	2	2	3	25	75	100
5	IV	22USSD	Soft Skills Development	2	2	3	25	75	100
			Total	30	30				800
6	III	22UZO6CC8	Developmental Biology	6	6	3	25	75	100
6	III	22UZO6CC9	Organic Evolution	6	6	3	25	75	100
6	III	22UZO6CP6	Developmental Biology & Organic Evolution (P)	5	3	3	40	60	100
6	III	22UZO6MBE2:1 22UZO6MBE2:2 22UZO6MBE2:3	Biochemistry and Biophysics Parasitology Insect Pest management	6	5	3	25	75	100
6	III	22UZO6MBE2:2 22UZO6MBE3:2 22UZO6MBE3:2	Project Work (Group) Bioinformatics and Biostatistics Public Health and Hygiene	6	5	3	40	60	100
6	V	Extension Activities	Extension Activities NCC, NSS, etc.	–	1	–	–	–	–
6	V	22UGS	Gender Studies	1	1	3	25	75	100
			Total	30	27				600
			Grand Total	180	140				3900

Language part –I	–	4
English Part –II	–	4
Core Paper	–	9
Core Practical	–	4
Allied Paper	–	4
Allied Practical	–	2
Non–Major Elective	–	2
Skill Based Elective	–	3
Major Based Elective	–	3
Environmental Studies	–	1
Value Education	–	1
Soft Skill Development	–	1
Gender Studies	–	1
Extension Activities	–	1

* for those who studied Tamil upto 10th+2 (Regular Stream)

+ Syllabus for other Languages should be on part with Tamil at degree level

those who studied Tamil upto 10th+2 but opt for other languages in degree level under Part I should study special Tamil in Part IV

** Extension Activities shall be outside instruction hours

Non Major Elective I & II – for those who studied Tamil under Part I

a) Basic Tamil I & II for other language students

b) Special Tamil I & II for those who studied Tamil upto 10thor +2 but opt for other languages in degree programme

Note:

	Internal Marks	External Marks
1.Theory	25	75
2.Practical	40	60
3. Project Work	40	60
3. Separate passing minimum is prescribed for Internal and External marks		

NME Courses offered to Other Department

22UZO3NME1– Human Physiology

22UZO4NME2–Human Diseases

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks] The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks] The passing minimum for University Examinations shall be 40% out of 60 marks [i.e. 24 marks]

Skill Based Elective	Course code	Title of the course
Skill Based Elective–1	22UZO4SBE1:1	Ornamental fish farming
	22UZO4SBE1:2	Sericulture
	22UZO4SBE1:3	Medical Lab technology
Skill Based Elective–2	22UZO5SBE2:1	Apiculture
	22UZO5SBE2:2	Vermitechnology

LIST OF SKILL BASED ELECTIVE COURSES

	22UZO5SBE2:3	Aquaculture
Skill Based Elective-2	22UZO5SBE3:1 22UZO5SBE3:2 22UZO5SBE3:3	Health Education Poultry Farming Dairy technology

LIST OF MAJOR BASED ELECTIVE COURSES

SEMESTER – I

Major Based Elective	Course code	Title of the course
Major Based Elective-1	22UZO5MBE1:1	Economic Entomology
	22UZO5MBE1:2	Wild life conservation and management
	22UZO5MBE1:3	Food and Nutrition
Major Based Elective-2	22UZO6MBE2:1	Biochemistry & Biophysics
	22UZO6MBE2:2	Parasitology
	22UZO6MBE2:3	Insect Pest Management
Major Based Elective-3	22UZO6MBE3:1	Project Work (Group)
	22UZO6MBE3:2	Bioinformatics and Biostatistics
	22UZO6MBE3:3	Public Health and Hygiene

Instruction: Hours: 6
Credit: 6

Internal Marks: 25
External Marks: 75

CORE COURSE 1 – INVERTEBRATA

Objective:

To study principles of animal classification, and to learn the salient feature of invertebrates.

Course Outcomes:

On completion of the course students will be able gain

- Knowledge on animal taxonomy and biology of protozoans to echinodermata.
- Ability to classify prozoans. The learner to understand the diversity and basic taxonomy of Non chordates.
- The learner will get an idea of adaptation and importance of non–chordates.
- The learner to identify the animal at basic level.
- The paper will give a strong observation skill and prompt to think about its conservation, sustainable economic utilisation and its potentials in technological prospects.

Unit I

Taxonomy: Definition, Principles of classification – symmetry and coelom – Units of classification – Binomial nomenclature – **Outline classification of Animal kingdom up to order level with example, Flowchart only.**

Unit II

Protozoa and Porifera: Type Study: Plasmodium –General topics: Protozoan parasites: Entamoeba– Trypanosoma – locomotion and nutrition in protozoa–**Type study:**Ascon sponge: General organization and histology–**General topic:** Canal system of sponges–Spicules in sponges.

Unit III

Coelenterata and Helminthes: Type Study: Obelia – Structure of Obeliacolony, Medusa, Nematocyst and Life cycle (Metagenesis) –**Type Study:** Fasciola hepatica (Liver Fluke) –Ascaris – External characters and Life cycle –**General topic:** Nematode parasitic adaptation.

Unit IV

Annelida and Arthropoda: Type Study: Earthworm – External morphology, setae and Nephridia– **Type Study:** Penaeus (Marine Prawn): External morphology, Appendages, Reproductive System and Development –**General topic:** mouth parts of insects (Mosquito, Honey bee, House fly and Cockroach) –Helpful insect, Productive insect.

Unit V

Mollusca and Echinodermata: Type Study: Pilaglobosa– External morphology, Digestive System and Respiratory System– **General topic:** Cephalopods as an advanced Mollusc – Economically important

Mollusca – Larval forms in Echinodermata –**Type Study:** Star fish External morphology, Pedicellaria and water vascular system.

Total topics	Local	Region	National	Global
31	1	1	1	31

Text Book

- Jordan.E.L and Verma.P.S, Invertebrate Zoology Revised Edn., S.Chand and Co. Ltd. Ram Nagar, New Delhi, 2014
- Invertebrate Zoology by Arumugam N. *et al.*,Saras Publications, Kottar, Nagercoil –2012
- Ekambaranatha Iyar and T.N. Ananthakrishnan. 1992. A Manual of Zoology, Vol.I. (Invertebrata).Parts I and II.Viswanathanand Co.

Books for references

- Jordon, E.L. and P.S. Verma. 1995 Invertebrate Zoology.12th Edn. Sultan Chand andco
- Dhami P.S. and J.K. Dhami (2003) Invertebrate Zoology, R.Chand and company, New Delhi.
- Kotpal R.L. (2005) Invertebrate Zoology, Third Edition published by Rakesh Rastogi for Rastogi Publications, Meerat.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
I	22UZO1CC1	Invertebrata					6	6			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓		✓	✓	✓	✓	✓		
CO2	✓	✓	✓		✓		✓		✓	✓	
CO3		✓		✓		✓		✓	✓	✓	
CO4	✓		✓	✓	✓		✓	✓	✓	✓	
CO5		✓		✓		✓	✓	✓	✓		
Number of Matches(✓) = 35 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – II

Course code: 22UZO2CC2

Instruction: Hours: 6

Credit: 6

Exam Hours: 3
Internal Marks: 25

External Marks: 75

CORE COURSE II-CHORDATA

Objective:

To study the diversity and adaptations of chordates.

Course Outcomes

On completion of the course students will be able.

- The learner to understand the diversity and basic taxonomy of chordates.
- The learner will get an idea of adaptation and importance of chordates.
- The learner to identify any vertebrate animal at basic level.
- The paper will give a strong observation skill and prompt to think about its conservation, sustainable economic utilisation and its potentials in technological prospects.
- Study and understand the various systems, adaptation and dentition in Mammals

Unit I

Prochordata & Pisces: General characters and classification of Chordata (upto class) with examples –
Type Study: Amphioxus – Scolidon – **General topics:** Affinities of Hemichordates – Retrogressive meta morphosis in Ascidia – Salient features of Cyclostomata – Accessory respiratory organs in fishes – Types of Fins and function,

Unit II

Amphibia: Classification and characters – Amphibia (up to order with examples) – **Type Study:** Frog –
General topics: Metamorphosis of Amphibian – Limbless Amphibians – Parental care in Amphibian – Paedomorphosis.

Unit III

Reptilia: Classification and characters of Reptilia (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 beak modification in birds – feet modification in birds – Migration of birds – Flightless birds

Unit V

Mammals: Classification and characters of Mammals (up to order with examples) – **Type Study:** Rabbit –
General topics: Origin of mammals – Diversity of Marsupials – Affinities of Prototheria – Aquatic mammals and adaptation Dentition in mammals – Adaptive radiation in Mammals.

Total topics	Local	Region	National	Global
39	6	6	6	39

Text Book

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. EkambaranathaAyyarand T.N. Ananthakrishnan, Manual of Zoology Vol – II, S. ViswanathanPvt. Ltd. Chennai..

Books for references

1. KotpalRLModern Text Book of Zoology Vertebrates, Rastogi Publications, Meerut.
2. Young, J.Z. 1950. Life of Vertebrates. Clarendon Press, Oxford, UK.
3. Pough Harvey F, Christine M .Janis and John B. Heiser .2002. Vertebrate Life, Pearson Education Inc. New Delhi.
4. Verma PS, Chordate Zoology, S Chand Publishers, New Delhi

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
I	22UZO2CC2	Chordates					6	6			
Course Outcomes(COs)	Programme Outcomes(Pos)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓		✓	✓	✓		✓		
CO2	✓		✓	✓		✓		✓	✓		
CO3	✓	✓	✓		✓	✓	✓	✓		✓	
CO4	✓	✓		✓			✓	✓		✓	
CO5	✓	✓	✓	✓	✓	✓		✓	✓	✓	

Number of Matches(✓) = 36 Relationship: High

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – II

COR Course code: 22UZO2CP1
E Instruction: Hours: 3
PRAC Credit: 3

Exam Hours: 3
Internal Marks: 40
External Marks: 60

TICAL 1 – INVERTEBRATA AND CHORDATA

Objective:

To acquire knowledge on organ systems through virtual dissection.

Course Outcomes:

- Gain knowledge to identify various animals based on morphological features.
- List the various invertebrate animals in a given class.
- Identify various larval stages and development in invertebrate groups.
- The student will be able to understand classify and identify the diversity of animals.
- Understand the basic concepts about chordates.

DissectionCharts:Virtual

1. Earthworm:Nervous system.
2. Cockroach:Digestive system.
3. Cockroach: Nervous system.
4. Cockroach: Circulatory system.
5. Pila:Digestivesystem

MountingCharts:

1. Earthworm–Bodysetae
2. Cockroach–Trachea
3. HoneyBee – MouthpartsandSting

Spotters:

1. Protozoa–ParameciumEntire,ParameciumConjugation,Euglena
2. Porifera–SimpleSponge,Gemmule,Spicules
3. Coelenterata–ObeliaColony, MedusaofObelia,SeaAnemone,
4. Helminthes–LiverFluke,RediaLarva,CercariaLarva,AscarisMaleand Female
5. Annelida–Earthworm,Nereis,Heteronereis,Leech
6. Arthropoda–Prawn,ZoeaLarva, MysisLarva,Peripatus, HoneyBeeandSilkWorm
7. Mollusca– Pila, Sepia, Octopus,PearlOyster
8. Echinodermata–StarFish,Sea–Urchin,Sea–Cucumber,BipinnariaLarva

Dissection: Virtual

1. Frog: Arterial system
2. Frog: Seventh cranial nerve.
3. Frog: Digestive system
4. Calotes: Venous system

Mounting Charts:

1. Shark–Placoid scales
2. Frog–Brain

Spotters:

A) Classify and give reasons:

Amphioxus, Balanoglossus, Shark, Hippocampus, Naja (Cobra), Pigeon, Rabbit

B) Draw and label sketch:

Frog–Pectoral Girdle, Pelvic girdle and, Hyoid apparatus, Quill Feather, Carapace,

C) Biological Significance:

Balanoglossus, Petromyzon, Echinocystis, Narcine, Ichthyophis, Axolotl larva, Chameleon and Bat

D) Comment on the identification of the following:

Skull of Rabbit, Dog and Human

Total topics	Local	Region	National	Global
10	2	1	2	5

TEXT BOOK

1. Allaby, M. (Ed.). Oxford Dictionary of Zoology. Oxford University Press, Oxford, 1999.
2. Meglitsch, P.A. and Schram, F.R.. Invertebrate zoology (Third Edition). Oxford University Press, New York. 1991.

REFERENCE

1. Brusca and Brusca. Invertebrates, Second Edition. Sinauer Assoc., Inc. Sunderland, MASS, USA. 2003.
2. Pearse and Buchsbaum,. Living Invertebrates. The Boxwood Press. Pacific Grove, CA, USA. 1987.
3. Pechenik,. Biology of the Invertebrates, Seventh Edition. McGraw Hill Education, New York, NY, USA. 2015.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
I	22UZO2CP1	Invertebrata and Chordata					5	4			
Course Outcomes(COs)	Programme Outcomes(Pos)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓		✓	✓	✓		✓	✓	
CO2	✓		✓	✓		✓		✓	✓	✓	
CO3		✓	✓		✓		✓	✓		✓	
CO4	✓	✓		✓			✓	✓		✓	
CO5		✓	✓	✓	✓	✓		✓	✓	✓	
Number of Matches(✓) = 35 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – III

U.G. Dept. of Zoology, Thanthai Hans Roever College (Autonomous), Perambalur – 621 220.(Syllabus 2022– 2023 onwards)

Course code: 22UZO3CC3
Instruction: Hours: 6
Credit: 5

Exam Hours: 3
Internal Marks: 25
External Marks: 75

CORE COURSE III–CELL AND MOLECULAR BIOLOGY

Objective:

To understand cell as the structural and functional unit and to learn about heredity and its variations

Course Outcomes

On completion of the course students will be able

- To understand the Principles of microscopes and Cytological techniques
- To describe the structure and functions cell and cell organelles
- To recognize the properties of cytoplasm and ultra structure of nucleus.
- To explain cell cycle and cell division
- To obtain knowledge on structure and functions of DNA and types of RNA

UNIT I

Microscopy : Principles and applications of Light, Phase Contrast, Fluorescent Microscope – Electron Microscopes: SEM, TEM –**Micro-technique** ; tissue fixation, sectioning and staining –Different types of bacteria –Ultrastructure organization of virus– bacteria and animal cell.

UNIT II

Plasma Membrane: Ultra structure, unit membrane and fluid mosaic models, Membrane proteins –peripheral and integral proteins– functions of plasma membrane –**Cytoplasm:** –Major elements of the cytoplasm– Structure,–structure and composition, physical and biological properties –**Endoplasmic Reticulum:** ultrastructure and functions.

UNIT III

Golgi complex :Morphology, structure, role in secretion – formation of acrosome – other functions –**Lysosome and Centrosome** :Morphology, chemistry and functions – **Mitochondria** : ultrastructure and functions –**Ribosomes** : ultrastructure and functions.

UNIT IV

Nucleus: ultrastructure of interphase nucleus –**Nucleolus and Chromosome:** structure and functions; Giant chromosomes :Polytene and Lampbrushchromosomes– **Cell divisions:** Mitosis and Meiosis –Cell cycles and its significance.

UNIT V

Molecular structure of DNA. DNA: Replication in prokaryotes and eukaryotes –
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DNA:repair mechanisms –DNA cloning– **RNA** : Types and functions –Genetic code – Gene Regulation–**Protein synthesis** :Transcription, Translation and post-translational modifications – Cancer Biology– Apoptosis– mechanism of programmed cell death – Stem cells.

Total topics	Local	Region	National	Global
36	2	2	2	36

Text Book:

1. Verma, P.S. and V.K. Agarwal. 2003. Cytology (Cell Biology and Molecular Biology). S.Chand Company Ltd, New Delhi.
2. Powar, C.B. 1997. Cell Biology.Himalaya Publishing House, Bombay.3. Kumar, H.D. 2003. Molecular Biology. Vikas Publishing House Pvt. Ltd., New Delhi.

Books for Reference:

3. De Robertis, E.D.P. and De Robertis E.M.F. 1995.Cell and Molecular Biology. 8th Edition, B.I. Waverly Pvt., Ltd., New Delhi.
4. Freidfelder, D. 2003. Molecular Biology.Narosa Publishing House, New Delhi.
5. Turner, P.C., McLennan, A.G., Bates, A.D and White, M.R.H. 2001. Molecular Biology. Second Edition. Viva Books Pvt. Ltd., New Delhi.
6. Verma, P.S. and V.K. Agarwal. 1998. Cell Biology. S.Chand Company Ltd., New Delhi.
7. Arumugam, N.2001. Cell Biology.Saras Publications, Nagercoil. 6. David, F. 2003. Molecular Biology.SecondEdition.Narosa Publishing House, New Delhi.
8. Jeyanthi, G.P., Molecular Biology, MJP Publishers, Chennai, 2009.

Relationship Matrix for COs, POs and PSOs

Semester	Code		Title of the Course			Hours		Credits		
III	22UZO3CC3		Cell and Molecular Biology			6		5		
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓	✓		✓
CO2	✓	✓		✓	✓		✓		✓	
CO3		✓	✓	✓	✓	✓		✓		✓

CO4		✓	✓	✓	✓	✓	✓		✓	
CO5	✓		✓	✓	✓		✓	✓		✓
Number of Matches(✓) = 35 Relationship: High										

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Code: 22UZO3NME1
Instruction Hours: 2
Credits: 2

Exam Hours: 3

Internal Marks: 25
External Marks: 75

NON MAJOR ELECTIVE COURSE - I

HUMAN PHYSIOLOGY

Objectives:

1. To provide basic knowledge about human physiology.
2. To study the various systems in the human body and their functions.

Course outcomes

- Acquire comprehensive knowledge of structure and physiology of various organs in the body
- Acquired comprehensive knowledge of respiratory organ and its functions
- This course focuses on anatomical terminology, anatomical identification and physiological processes of human body
- Acquired comprehensive knowledge of excretion
- Acquired comprehensive knowledge of endocrine glands- structure, secretions and functions.

UNIT - I Cell

Cell General introduction of human systems–**Cells** under electron microscope - Recent concepts – **Tissues**: Classification, structure and function.

UNIT – II Physiology of digestion and respiratory system

Digestive System- Anatomy of gastro-intestinal tract - Digestion and absorption of carbohydrates, proteins and fats - Anatomy and physiology of respiratory organs - Gaseous exchange in the lungs, mechanism of respiration.

UNIT - III Excretory System , Physiology of Nerve and Muscle

Structure of kidney - formation of urine, acid-base balance, skin temperature regulation, water balance - ADH regulation in excretion- Conduction of nerve impulses - Physiology of muscle contraction - **Nervous System** :General anatomy of nervous system - functions of the different parts reflexes, autonomic nervous system - **Sense Organs** Physiology of vision, hearing, taste', smell and cutaneous sensations.

UNIT – IV Blood

Composition, constituents, functions, wounds, hemorrhage, - clotting - reticulo - endothelial system, body defence against diseases - **Heart And Circulation** - Anatomy of the heart - structure of. the heart and blood vessels- properties of cardiac muscle - origin and conduction of heart beat -cardiac cycle, cardiac output, heart sounds, blood pressure - definition and factors affecting blood pressure and ECG.

UNIT - VEndocrinology

Endocrinology: Pituitary, thyroid, parathyroid, adrenal and pancreas - functions of the hormones and their relationships - Reproductive System Anatomy of male and female reproductive organs - hormonal regulation of female reproductive function - menstruation, fertilization, pregnancy- parturition - lactation - hormone influence.

Total topics	Local	Region	National	Global
35	1	1	1	35

Text Books

- 1.Gupta, A.P., (2010). Anatomy and physiology. Agra: Sumit Prakashan.
2. Moorthy, A.M., (2014). Anatomy Physiology and Health Education. Karaikudi: Madalayam publication.
3. S.C. Rastogi. Essentials of Animal Physiology. New Age International Publishers. 2001.

References

1. Guyton, A.C. Functions of the Human Body, W.B. Saunders Co., Philadelphia.
2. Vander, A.J , Sherman, J.H. and Luciano, D.S. Human Physiology - the Mechanisms of Body Functions, 2nd ed., TMH Publishing Co., Ltd.,
3. Subramaniam, S. and Madhavan Kutty, K. 1971. The Text Book of Physiology, 1st ed., Orient Longman Ltd.
4. Best, CH and NB Taylor, The living body, latest edition, Asia publishing house, Bombay.
5. Ham, A.W., Histology, Latest edition. Pitman Medical Publishing Ltd., London,

Relationship Matrix for COs, POs and PSOs

U.G. Dept. of Zoology, Thanthai Hans Roever College (Autonomous), Perambalur – 621 220.(Syllabus 2022– 2023 onwards)

Semester	Code	Title of the Course					Hours	Credits			
I	22UZO3NME1	Human physiology					2	2			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓		✓	✓	✓	✓	✓		✓	
CO2	✓	✓	✓		✓	✓		✓	✓	✓	
CO3	✓		✓	✓	✓		✓	✓	✓	✓	
CO4	✓	✓	✓	✓		✓	✓		✓	✓	
CO5	✓		✓	✓	✓	✓		✓	✓	✓	
Number of Matches(✓) = 40 Relationship: High											

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – IV

Course code: 22UZO4CC4

Instruction: Hours: 4

Credit: 4

Exam Hours: 3

Internal Marks: 25

External Marks:75

CORE COURSE IV: GENETICS

Objective:

To learn the mechanism of inheritance pattern and its use in medical science.

Course Outcomes

On completion of the course students will be able

- To acquire basic information on genetics and Mendelian laws
- To understand multiple alleles and pedigree analysis in human traits.
- Students will be able to describe the flow of genetic information.
- Students will be able to explain role of genes and micro organisms.
- The students will able to explain how mutation occur and how its role in adaptation and speciation.

UNIT I: MENDEL'S LAW AND INHERITANCE

Mendel's laws – Monohybrid –Dihybrid Experiments – Test cross and Back cross – Linkage and linked genes – Crossing over –gene mapping – Multiple alleles: ABO –Rh blood group in man– coat colour in rabbit – polygenic inheritance –Importance of Drosophila in genetics.

UNIT II: SEX DETERMINATION

Sex determination in man – Drosophila – sex chromosome and their evolution – chromosomal theory of sex determination – Environmental –Hormonal factors in sex determination – sex linked inheritance in man: **colour blindness**–haemophilia – Chromosomal aberration.

UNIT III: GENES AND GENETIC CHANGES

Concept of gene – split genes–Genetic code – Gene expression –gene regulation – Lac operon – Mutation: types of gene mutation–**chemical mutagenesis**– DNA damage and repair – Chromosomal aberration: Euploidy–aneuploidy–polyploidy–structural changes –Deficiency–Amplification–Duplication–translocation –inversion.

UNIT IV: MICROBIAL GENETICS

DNA, RNA as genetic material: Avery and Griffith experiment – Hershey and Chase experiment –**Recombination in Bacteria: Transformation–Conjugation–Transduction**– Recombination in phages – Lytic –Lysogenic cycles–Genetic application of bacteria.

Unit V: HUMAN GENETICS

Human Genetics: Karyotype –Pedigree analysis – Syndromes in man: Turner–Klinefelters–Downs –Inborn Errors of Metabolism – Hereditary diseases in Man: Phenylketonuria–Alkaptonuria–Albinism–Thalassemia –Sickle cell anemia – Genetic counseling – Eugenics – Euthenics – Human genome project.

Total topics	Local	Region	National	Global
63	1	1	3	58

Text books:

.Verma. P.S. and V.K. Agarwal. Concept of Genetics, Human Genetics and Eugenics., S. Chand & Company Ltd, New Delhi.1998.

3. R.P. Meyyan, Genetics, Saras publication, 114 /35. A.R.P. Camp road, Perivilar, Kottor (post).Nagerkoil. 2012.

Reference books :

1. Friefelder, D., Microbial Genetics. Narosa Publishing, New Delhi.2nd Edition,1997.

2. Goodenough, Ursula. Genetics. Saunders College Publishing International, New York. 1997.

3. Lewin, B. Gene VI. Wiley Eastern Ltd., New Delhi.1998.

4. Rothwell, N.V., Human Genetics. Prentice Hall of India, New Delhi.1979.

5. Sinnott, E.W., L.C. Dunn and L.C. Dobzhansky, T., Principles of Genetics. Tata McGraw Hill., New Delhi.1985.

6. Gardner, A.S., Principles of Genetics. Wiley Eastern, Pvt., Ltd.1984.

7. Mitra, S., Genetics – a blue print of life. Tata McGraw Hill Pub. Co., Ltd., Delhi. 1994.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
IV	22UZO4CC4	Genetics					4	4			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓		✓	
CO2	✓	✓		✓	✓		✓		✓		
CO3	✓	✓	✓	✓	✓	✓		✓		✓	
CO4		✓	✓	✓	✓	✓	✓		✓		
CO5	✓		✓	✓	✓		✓	✓		✓	
Number of Matches(✓) = 37 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – 1V

Course code: 22UZO4CP2

Instruction: Hours: 3

Credit: 3

Exam Hours: 3

Internal Marks: 40

External Marks: 60

CORE PRACTICAL–1V CELL AND MOLECULAR BIOLOGY & GENETICS

Objective:

- To develop practical skills for the analysis of cell organelles
- Students will communicate scientific concepts, experimental results and analytical arguments clearly and concisely, both verbally and in writing.
- Be able to describe the genetics and its mechanisms.

Course Outcomes:

- The learner will understand the importance of cell as a structural and functional unit of life.
- The learner understands and compares between the prokaryotic and eukaryotic system and extrapolates the life to the aspect of development.
- To understand how the behaviour of chromosomes during meiosis can explain mendelian traits.
- To understand how inheritance patterns are affected by position on chromosomes.
- To understand the similarities and differences between how genetic information is passed on in male and female.

CELL AND MOLECULAR BIOLOGY:

I. Cytometry

1. Compound microscope
2. Camera Lucida
3. Stage and Ocular Micrometers

II. SlidePreparation

Buccal smear.

Mitosis in onion root tip squash.

Squash preparation of Grasshopper testes.

III. Studyofpreparedslidesofhistology.

Animalcell –Mitochondria –Nucleus –DNAhelicalstructure –
ColumnarEpithelium–Ciliated epithelium– Glandular Epithelium –
Cartilage T.S – Bone T.S – Cardiac Muscle –Striatedmuscle –
NonStriatedmuscle– Neuron – C.SofmammalianTestis– Ovary.

GENETICS:

1. Mono hybrid Cross
2. Di hybrid Cross
3. Drosophila: male and female identification, Mutant forms (from pictures), Genetic importance.
4. Observation of simple Mendelian traits in man.

5. Human Karyotypes: Normal, Down's syndrome, Klinefelters syndrome, Turner syndrome.
6. Recording of Mendelian traits in humans.
7. Study of multiple alleles – Human Blood Grouping (ABO blood grouping)
8. Human Rh factors

Total topics	Local	Region	National	Global
15	7	3	1	4

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
IV	22UZO4CP2	Cell and Molecular Biology & Genetics (P)					3	3			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1		✓	✓	✓	✓	✓	✓	✓		✓	
CO2		✓		✓	✓		✓		✓		
CO3	✓	✓	✓	✓		✓		✓		✓	
CO4		✓	✓	✓	✓	✓	✓		✓		
CO5	✓		✓	✓	✓		✓	✓	✓	✓	
Number of Matches(✓) = 35 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

Course Code: 22UZO4NME2
Instruction Hours: 2
Credits: 2

Exam Hours: 3

Internal Marks: 25
External Marks: 75

NON MAJOR ELECTIVE COURSE - II

HUMAN DISEASES

Objectives:

1. To impart the knowledge of important human diseases with respect to their causative agent, clinical symptoms, pathogenesis, mode of transmission, prevention and treatment.

Course Outcomes

On completion of the course students will be able

- Define common disease terms and major categories of human disease.
- Describe the most common diagnostic tests and procedures.
- Describe the major disorders, diagnostic methods and treatments, including drug therapy and surgery of each body system to include those listed in the course outline.
- Describe the terms associated with basic pharmacology and how communicable diseases are transmitted and controlled.
- Describe the most common genetic disorders, their causes, method of diagnosis and treatments

UNIT - I

Communicable Diseases: Symptoms - Prevention and Control of Communicable Diseases - Community Diagnosis: Tuberculosis – covid 19

UNIT - II

Non-communicable Diseases: Symptoms, Prevention and Control of Non-Communicable Diseases - Community Diagnosis: Alzheimer's - Asthma - Chronic Kidney Disease - Diabetes

UNIT – III

Hereditary disease: Symptoms, Prevention - Control measures of Diseases: Cystic fibrosis - Sickle Cell Anemia - Marfan syndrome.

UNIT - IV

Zoonotic disease: Symptoms, Prevention - Control measures: Anthrax - Animal influenza - avian influenza.

UNIT - V

Nutritional deficiency: Symptoms, Prevention - Control measures of Diseases: Rickets - Goiter -

Anemia - Beriberi.

Total topics	Local	Region	National	Global
24	5	5	5	24

References

1. Textbook of human disease in dentistry by M. Greenwood, R. A. Seymour & J. G. Meechan UK.
2. White, Tim (19 December 2014). "What is the Difference Between an 'Injury' and 'Disease' for Commonwealth Injury Claims?" *TindallGask Bentley*. Archived from the original on 27 October 2017. Retrieved 6 November 2017.
3. "What is the deadliest disease in the world?" *WHO*. 16 May 2012. Archived from the original on 17 December 2014. Retrieved 7 December 2014

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
I	22UZO4NME2	Human Diseases					2	2			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
C01	✓	✓		✓	✓	✓	✓	✓		✓	
C02	✓	✓	✓		✓	✓		✓	✓	✓	
C03	✓		✓		✓		✓	✓	✓	✓	
C04	✓	✓	✓	✓		✓	✓		✓	✓	
C05	✓		✓	✓	✓	✓		✓	✓	✓	
Number of Matches(✓) = 39 Relationship: High											

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – IV

Course code:22UZO4SBE1:1

Instruction: Hours: 2

Credit: 2

Exam Hours: 3

Internal Marks: 25

External Marks: 75

SKILL BASED ELECTIVE ORNAMENTAL FISH FARMING

Objective:

To acquire skills in establishing fish farm

Course Outcomes:

On completion of the course students will be able

- To gain knowledge on introduction and importance of ornamental fish culture
- To understand and importance of freshwater and marine ornamental fishes
- To describe the Mass production of fancy fishes
- To get knowledge on harvesting methods of fishes
- To realize the economic status of ornamental fishes

UNIT I

Importance and scope of ornamental fish culture, Economics –Commercial value– 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 and marine ornamental fishes –Indigenous –Exotic species: Guppy, Sword tail, Gold fish, Angel fish, Blue morph, Anemone fish, Butterfly fish, Zebra fish, Koi, Tetra, Molly, Glass fish, Cichlids, Hippocampus and Scat fishes.

UNIT III

Mass production of fancy fishes: Preparations for breeding – breeding behaviour of chosen fishes– molly and fighter fish – Induced breeding –Food and feeding: Preparation and composition of formulated fish feeds – Live feeds: rotifers, tubifex– Live fish transport–Fish handling, packing and forwarding techniques.

UNIT IV

Aquarium design, Construction and preparation: size, shape, substrate, ornamental aquatic plants–Construction and functions of Bio filters, aerators –accessories for fish tanks– hood and light, nets, suction tube - Benefits of monoculture – polyculture.

Unit V

General Aquarium maintenance – Maintenance of water quality: controlling ammonia build up– Temperature–pH–feeding regimes –Disease management: Common Bacterial; Erythroderma, Enteritis –

Viral; Epizootic ulcerative syndrome (EUS) – Infectious pancreatic necrosis (IPN) –Fungal; Gill rot, saprolegniasis–Protozoan; Whirling Disease–Costiasis Disease–infections, their treatment and control– General benefits of Aquarium.

Total topics	Local	Region	National	Global
31	7	14	2	8

Text Book

1. Santhanam, R., N. Sugumaran and P. Natarajan. 1987. A manual of Fresh water aquaculture. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Shanmugam, K. 1992. Fishery Biology and Aquaculture. Leo Pathipagam, Madras.
3. Jameson, J.D. and R.Santhanam (1996). Manual of ornamental fisheries and farming technology. Fisheries College and Research Institute, Thoothukudi.

Books for references

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

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
IV	22UZO4SBE1:1	Ornamental fish farming					2	2			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓		✓	✓	✓	✓	✓		✓	
CO2	✓	✓		✓	✓	✓	✓		✓		
CO3	✓	✓	✓	✓			✓	✓		✓	

CO4		✓	✓	✓	✓	✓	✓		✓	
CO5	✓		✓	✓	✓	✓	✓	✓		✓
Number of Matches(✓) = 37 Relationship: High										

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – IV

Course code:22UZO4SBE1:2

Instruction: Hours: 2

Credit: 2

Exam Hours: 3

Internal Marks: 25

External Marks: 75

SKILL BASED ELECTIVE

SERICULTURE

Objective

To acquire skills in establishing, sericulture

Course Outcomes:

On completion of the course students will be able

- To gain knowledge on introduction and importance of sericulture
- To understand classification and biology of silk moth
- To describe the tools of sericulture
- To get knowledge on harvesting methods in sericulture
- To realize the economic status of sericulture

Unit – I

Introduction – Importance of sericulture– Mulberry plant – Classification of commercial varieties of mulberry –Mulberry plant cultivation practices –Non mulberry silk varieties–Moriculture.

Unit – II

Classification and Biology of silk moth – familiar and economically import types of silkworms – life cycle study of Bombyxmori– Diseases of silk worms –fungal:Muscardine–bacterial:Flacherie–viral :Grasserie –Protozoon :Pebrine–diseases and their remedial measures.

Unit – III

Tools of sericulture:cultural methods – management of mulberry silk worms – Silkworm rearing operations – Chawki rearing – late age rearing techniques.

Unit – IV

Harvesting methods: Physical and commercial characters of cocoons –Reeling operations,– importance of byproducts of Sericulture–Economic importance of sericulture.

Unit – V

Economics of Sericulture:Future and progress of sericulture in India – Role of State and Central silk board – employment opportunities – Prospects of sericulture as self Employment as cottage industry.

Total topics	Local	Region	National	Global
29	17	5	5	2

Text Book

1. Ganga, G. 2003: comprehensive sericulture Vol–I, Moriculture– Oxford –IBH Puubl. Co. India.

2. Ganga, G. 2003: comprehensive sericulture Vol –II Silkworm rearing – Oxford – IBH

Publ. Co. India.

Books for Reference:

1. Ganga, G. and SculochanaChetty, J. 1997: An Introduction to sericulture Oxford – IBH
Publ. Co. India.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
IV	22UZO4SBE1:2	Sericulture					2	2			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓		✓	✓	✓	✓	✓		✓	
CO2		✓		✓	✓	✓	✓		✓	✓	
CO3		✓	✓	✓				✓		✓	
CO4		✓	✓	✓	✓	✓	✓		✓	✓	
CO5	✓		✓	✓	✓	✓	✓	✓		✓	
Number of Matches(✓) = 36 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – IV

Course code:22UZO4SBE1:3

Instruction: Hours: 2

Credit: 2

Exam Hours: 3

Internal Marks: 25

External Marks: 75

SKILL BASED ELECTIVE

MEDICAL LAB TECHNOLOGY

Objectives

To understand the importance of lab technology

Course Outcomes:

On completion of the course students will be able

- Learn the safety issues in laboratory conditions and acquire knowledge on the safety disposal of waste materials
- To familiarize techniques for the analysis of blood, urine and microbes under disease conditions
- Acquire knowledge on the use of RIA, ELISA, WESTERN BLOT, WIDEL TEST and DNA Finger Printing.
- Acquire knowledge on medical lab technology.
- Acquire knowledge on estimations sugar, Albumin, Ketone bodies, lipids etc.

Unit – I

Laboratory and Safety

The laboratory: Safety–Contaminants– Physical, Chemical, Biological Contaminants. – Universal work precautions (NWP) for laboratory personnel – Disposing of Biomedical waste.

Unit – II

Hematological Parameters

Haemoglobin content–Differential Count – Haematocrit– packed cell volume –MCH – MCHC –MCV – Erythrocyte sedimentation rate – platelet count – clotting time – Bleeding time–prothrombin time– Haemorrhagic disorders

Unit – III

Urine Tests

Knowledge and skill in the study and analysis of urine – Physical parameter– Colour, odor, PH, Density – Chemical parameters :Sugar, Albumin, Ketone bodies – their clinical significances – pregnancy tests.

Unit – IV

Clinical microbiology

Microbial analysis of Urine, Faeces– Sputum. –Parasitic analysis in Blood –Faeces– Analysis of semen– cerebrospinal fluid for clinical investigation.

Unit – V

Modern Analysis

Molecular diagnostic techniques – RIA – ELISA– WESTERN BLOT– PCR –RT- PCR– WIDEL TEST – DNA finger printing.

Total topics	Local	Region	National	Global
37	4	0	6	27

Text Book

- 1 Ramnik and Sood (2009) Medical Laboratory Techniques, Jaypee Brothers, New Delhi.
2. Kanai L. Mukherjee and Swarajit Ghosh (2009) Medical Laboratory Techniques, , Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
3. B. S. Chauhan (2009) Principles of Biochemistry and Biophysics, first edition, Luxmi publishers, New Delhi.

Books for references:

1. Garrod, L.P. (2008) Medical Laboratory Techniques, BMJ publishers, USA.
2. Estridge, B.H., Reynolds, A.P. and Walters N.J. (2007) Basic Clinical Laboratory Techniques, Cengage Learning, Hyderabad.
3. Singh, A. and Singh, R (2004) Biophysical Chemistry (Principles and Techniques) Campus Books International, New Delhi.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
IV	22UZO4SBE1:3	Medical Lab technology					2	2			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓		✓	
CO2	✓	✓	✓	✓	✓	✓	✓		✓		
CO3	✓			✓				✓		✓	
CO4	✓	✓	✓	✓	✓	✓	✓		✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓		✓	
Number of Matches(✓) = 38 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – V

Course code: 22UZO5CC5
Instruction: Hours: 5
Credit: 5

Exam Hours: 3
Internal Marks: 25
External Marks:75

CORE VII: ANIMAL PHYSIOLOGY

Objectives:

To understand the structural organization of the animals. and to analyse the functional aspects of organ systems in the body of animals.

Course Outcomes:

On completion of the course students will be able.

- The students will be able to explain how the various organ systems are coordinated and controlled.
- The students will be able to list the functions of various organs in relation to physiological process.
- The students will develop the idea of multilevel controlling and feedback mechanism in relation to various physiological functions.
- The students will be able to understand the basic physiological process related to adaptation, metabolism and major requirement.
- To make awareness to the students about how the structure–function relationships synchronise along with the molecular signals.

Unit I

Nutrition and Respiration

Nutrition: Digestive system of man– Digestion and absorption of carbohydrates, proteins and lipids– Minerals and 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 and Excretion

Blood; composition and functions – Mechanism of clotting– bleeding – Structure of heart–Types of Hearts – Heartbeat and pace maker – Cardiac cycle – Cardiac rhythm – ECG – Pulse and blood pressure – Structure of excretory organ– Nephron structure – mechanism of urine formation – Excretory products– Osmo–regulation in fishes.

Unit III

Muscle and Nerve Physiology

Types of muscles – Ultra structure of striated muscle – Muscle contraction and properties – Neurons – structure and 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

U.G. Dept. of Zoology, Thanthai Hans Roever College (Autonomous), Perambalur – 621 220.(Syllabus 2022– 2023 onwards)

Endocrine glands in man – Hormones, action and disorders – Feed-back mechanism – Outlines of mechanism of hormonal activity in Puberty – menstrual cycle – adolescence – pregnancy – parturition – lactation – birth control.

Total topics	Local	Region	National	Global
46	1	1	1	46

Text Book:

1. Arumugam N and.Mariakuttikan A Animal Physiology Saras Publications, Nagercoil.
2. Bhagavan NV, Medical biochemistry, fourth edition Academic Press.

Books for reference:

1. Guyton AC, Hall JE, Text Book of Medical Physiology, Elsevier
2. Jain AK Textbook of Physiology. Avichal Publishing Company.
3. Lehninger AL, Michael Cox, Nelson DL, Biochemistry. Macmillan.
4. Tyagi BS, Agarwal VK and Verma PS Animal Physiology S. Chand Publishers, New Delhi
5. Rastogi, S. C. Essentials of Animal Physiology. Wiley Eastern Limited. New Delhi.1979
6. Berry A. K., A Text book of Animal Physiology. Emkay Publications.1st Edition, 1998
7. Hoar, S. Williams. General and Comparative Physiology. Prentice Hall.1987.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	22UZ05CC5	Animal Physiology					5	5			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓		✓		✓		✓	✓	✓	
CO2	✓		✓		✓	✓	✓		✓		
CO3		✓	✓	✓		✓		✓		✓	
CO4	✓	✓		✓		✓	✓	✓	✓	✓	
CO5		✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 35 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – V

Course code: 22UZO5CC6

Instruction: Hours: 5

Credit: 5

Exam Hours: 3

Internal Marks: 25

External Marks: 75

CORE COURSE VI– IMMUNOLOGY

Objective:

To comprehend the immune system and functions of lymphoid organs. and to study the various immunological techniques and its applications.

Course outcomes

On completion of the course students will be able.

- To describe lymphoid organ and immune system.
- To gain information regarding immunoglobulin and immune deficiency diseases.
- Development of knowledge on the cellular ontogeny and organ involvement in immunity and how the immune system can fight infections and diseases.
- Knowledge on development of body immune mechanisms and their applications.
- Understanding of current immunology news and issues.

Unit I

Scope – History – Innate immunity – Acquired immunity– Structure and functions of Primary – Secondary lymphoid organs – Cells of Immune System– Types of Lymphocytes – Macrophages – Antigen Presenting Cells –Mast cells – Polymorpho nuclear cells.

Unit II

Antigens: Types and Properties of Antigens – Haptens – Adjuvants–Immunioglobulins –Types– Structure and Functions – Biological properties of Antibodies – Synthesis of Antibodies –Vaccines and its types.

Unit III

Immune response – Antigen – Antibody reaction – Primary –Secondary immune response – Humoralimmunity– Cell mediated Immune response – Role of B cells in Antibody production – Cytokines – Lymphokines– Heparin.

Unit IV

Major Histocompatibility Complex in man; Human Leukocyte Antigen (HLA)– Complements; Salient features – Functions – Hypersensitivity Types: Anaphylaxis –Auto Immune diseases– Rheumatoid arthritis– Systemic lupus erythematosus – Immunodeficiency diseases – Severe combined immune deficiency (SCID) – AIDS.

Unit V

Immunological Techniques: Agglutination – Precipitation – Simple double – single radial immune diffusion – Counter current – Rocket –Immuno electrophoresis–ELISA – Western Blotting – WIDAL – VDRL test – Hybridoma technology.

Total topics	Local	Region	National	Global
53	1	1	1	53

Text Books:

1. Nandhini Shetty (1994) Immunology, Introductory Text Book, New Age Int. (P) Ltd. Publications, New Delhi.
2. Dulsy Fatima et al., (2000) Immunology, Saras Publications, Nagercoil, Tamil Nadu.

Books for Reference:

1. Roitt, (3rd Edition) Immunology, Crover Medical Publishing Company, London
2. Barret, J. T. (1983) Text Book of Immunology (5th Edition), The C.V. Mosby Company.
3. Richard, H.M. (1992), Immunology (2nd Edition), Williams and Wilkins, Baltimore Maryland.
4. Hidemann, W.H. (1980) Essentials of Immunology, Elsevier Science Publishing Co. Inc.
5. Weinn. D.M. and Steward, L. (1993), Immunology, Singapore Publishers Private Ltd.,

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	22UZO5CC6	Immunology					5	5			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓		✓		✓		✓	✓	✓	
CO2	✓	✓		✓		✓	✓	✓	✓	✓	
CO3		✓	✓	✓		✓		✓		✓	
CO4	✓	✓		✓		✓	✓	✓	✓	✓	
CO5		✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 37 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – V

Course code: 22UZO5CC7

Instruction: Hours: 5

Credit: 5

Exam Hours: 3

Internal Marks: 25

External Marks: 75

CORE COURSE VII– ENVIRONMENTAL BIOLOGY

Objective:

To understand the importance of environment, its protection and conservation.

Course Outcomes:

On completion of the course students will be able.

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

Unit I

Concept of Ecology

Concept of Ecosystem structure & function–Abiotic factors– Light, Water, Temperature and Soil and their impact –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 – Threat categories

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 – Global warming and climate change.

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, Tiger reserves in Tamilnadu – Afforestation & Deforestation – Human animal conflicts.

Total topics	Local	Region	National	Global
40	2	3	10	27

Text Book

1. Arumugam N *Concepts of Ecology*, Saras Publication, Nagercoil.
2. Gupta PK, *Cytology, Genetics and Evolution*, Rastogi Publications, Meerut.
3. Verma PS, and Agarwal VK, *Environmental Biology: Principles of Ecology*, S Chand Publishers, New Delhi.

Books for references:

4. Sharma PD, *Elements of Ecology*, Rastogi Publications, Meerut.
5. Chapman JL and 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.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	22UZO5CC7	ENVIRONMENTAL BIOLOGY					5	5			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1		✓	✓	✓		✓		✓		✓	
CO2	✓	✓		✓		✓	✓	✓	✓	✓	
CO3		✓	✓		✓	✓	✓	✓	✓	✓	
CO4	✓	✓		✓		✓	✓	✓	✓	✓	
CO5		✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 38 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – V

Course code: 22UZO5CP3
Instruction: Hours: 4
Credit: 4

Exam Hours: 3
Internal Marks: 40
External Marks:60

CORE PRACTICAL–III

ANIMAL PHYSIOLOGY, IMMUNOLOGY AND ENVIRONMENTAL BIOLOGY(P)

Objective:

- To impart an overview of basic physiological functions of various organ system in human.
- To make an awareness about various effects of pollution and its management.
- To make awareness to the students about how the structure–function relationships synchronise along with the molecular signals.
- Students are able to understand immunological techniques.

Course Outcomes:

- An understanding of invertebrate and vertebrate animal physiology, emphasising control mechanisms and response strategies used to cope with different external environments.
- Students will appreciate how physiological plasticity is key to maintaining and adjusting physiological processes in terrestrial and aquatic animals.
- Acquire knowledge on Immunological techniques.
- Familiarize the modern laboratory techniques applicable to the diagnosis and monitoring of diseases involving the immune system.
- Understand analytical estimation procedures of chief nutrients

Animal Physiology

1. Human Salivary Amylase activity in relation to Temperature.
2. Identification of Nitrogenous Waste Products.
3. Total count of RBC and WBC and Differential count of WBC.
4. Quantitative tests for Carbohydrates, Proteins, and Lipids.
5. Simple tests for Sugar, Albumin, and Urea in Human Urine.
6. Estimation of Haemoglobin.

Spotters

Centrifuge –pHmeter– Colorimeter – ECG – Sphygmomanometer – Pregnancy test kit –
Haemoglobinometer–Haemocytometer.

Immunology

Primary and Secondary Lymphoid organs in fish – Immunoglobulins: IgA, IgG, IgM and IgE.

U.G. Dept. of Zoology, Thanthai Hans Roever College (Autonomous), Perambalur – 621 220.(Syllabus 2022– 2023 onwards)

Spotters: Immunoelectrophoresis – ELISA – Blotting techniques: – Southern – Northern – Western.

Ecology

1. Estimation of dissolved oxygen.
2. Estimation of salinity.
3. Estimation of Calcium.
4. Total dissolved solid waste
5. Mounting and identification of plankton (fresh water / marine).
6. Spotters: Animal association– Intertidal fauna–Secchidisk–Maximum and minimum thermometer– Barometer–Luxmeter–Turbidity meter–Electrical conductivity meter.
7. Field visit – local polluted area.

Total topics	Local	Region	National	Global
15	10	0	0	5

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	22UZO5CP3	Animal physiology, Immunology and Environmental Biology (P)					4	4			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓		✓			✓	✓	✓	✓	
CO2		✓	✓		✓		✓	✓	✓	✓	
CO3		✓	✓		✓	✓	✓	✓	✓	✓	
CO4	✓	✓		✓			✓	✓	✓	✓	
CO5		✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 35 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – V

Course code:22UZ05MBE1:1

Instruction: Hours: 5

Credit: 5

Exam Hours: 3

Internal Marks: 25

External Marks: 75

MAJOR BASED ELECTIVE ECONOMIC ENTOMOLOGY

Objective:

To learn the importance of economic entomology

Course outcomes:

On completion of this course students will able

- Understands role of insects in agriculture.
- Studies insect structure and function.
- Realising various insect pests of various food, fibre, oil and other crops.
- Learns to apply various agricultural equipments.
- Understands insect pest management.
- Practices will give hand on training to the learner.

Unit I

Insect Pests: Definition – Classification–Primary and Secondary pests – Major and Minor pests – Pests of Paddy: stem borer (*Scirpophagaincertulas*) – plant hoppers (*Nilaparvatalugens*)–Sugarcane Pests: Early shoot borer (*Chiloinfuscatellu*) – Internode borer (*Chilosacchariphagusindicus*)– Cotton Pests: American boll worm (*Helicoverpaarmigera*) – Tobacco caterpillar (*Spodopteralitura*) – Their Biology, Nature of damage and management methods– Pest outbreak – Pest resurgence –Pests of stored products Rice weevil (*Sitophilus oryzae*) –American wheat weevil (*Rhyzoperthadominica*)–Red flour beetle (*Triboliumcastaneum*) –Pulse beetle (*Callosobruchus maculates*) – Indian meal moth (*Plodiainterpunctella*)– their Management methods.

Unit II

Principles of insect control: Biological controlProphylactic measures – An overview of cultural, mechanical, physical–biological and chemical methods–Pesticides – classification–types of pesticide formulation– mode of action– toxicity. – Nonconventional methods of Insect Management – Insect Growth Regulators (IGRs)– Repellents – Antifeedents– Pheromones –Chemosterilants– Irradiation, Quarantine methods– Botanical Pesticides and their use in management of insect pests of crops.

Unit III

Integrated Pest Management (IPM): Definition of Integrated Pest Management and Integration of methods – Potential components of IPM and its application – Insect plant interactions –Pest : Predator Complex – Ecological balance – Economic Threshold Levels (ETLs).

Unit IV

Beneficial insects: Economic importance of honey bee – silk worm and lac insect – Pollinators – soil builders – scavengers – Biological control agents of Insect Pests – Pathogens – Bacterium (*Bacillus thuringiensis*)–fungus (*Entomophagaimaiga*)– Parasites parasiticwasp (*Edovumputtleri*)– Parasitoid (*Encarsia Formosa*)– Predator lady beetle (*Coleomegilla maculate*).

Unit V

Insects and Diseases: Biology of insect vectors –Housefly –pediculus– Mosquito – Flea and Cockroaches –Mode of transmission pathogens– epidemiology of typhoid fever– dengue – malaria.

Total topics	Local	Region	National	Global
61	11	15	8	27

Text Book

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.
3. Chapman, R. F. 1988. The Insects Structure and function. Cambridge University Press, U.K.
4. Kumar, A. and Nigam, P.M. 2003. Economic and Applied Entomology.Emkay Publications, Delhi.

Books for References

1. Pedigo, L.P.2003. Entomology and pest management. Pearson Education (Singapore) Pvt. Ltd., Delhi.
2. Prakash, I and Mathur, R.P.1987. Management of Rodent Pests. ICAR, New Delhi.
3. Singh, R. and Sachan, G.C. 2004. Elements of Entomology.Rastogi Publications, Meerut.
4. Fitzwater, W.D. and Prakash, I. 1989. Handbook of vertebrate pest control. ICAR, New Delhi.
5. Ambrose, D.P. 2004.General Entomology. Kalyan Publishers, West Bengal.
6. Rathinasamy, T.K.1986. Medical Entomology.SViswanathan and Co., Madras, India.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	22UZO5MBE1:1	Economic Entomology					5	5			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
C01	✓	✓		✓			✓	✓	✓	✓	
C02	✓	✓	✓		✓		✓	✓	✓	✓	
C03		✓	✓		✓	✓	✓	✓	✓	✓	
C04	✓	✓		✓			✓	✓	✓	✓	
C05		✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 36 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – V

Course code:22UZ05MBE1:2

Instruction: Hours: 5

Credit: 5

Exam Hours: 3

Internal Marks: 25

External Marks: 75

MAJOR BASED ELECTIVE

WILD LIFE CONSERVATION AND MANAGEMENT

Objective:

To understand the basic concepts of wild life conservation and management

Course outcomes:

On completion of this course student will able

- Understand the IUCN categories.
- Understand the distribution and biology of Indian wildlife including their conservation status.
- Gain insight on the different methods and projects implemented including various laws.
- To know the acts and regulations for the conservation of wildlife.
- To know Zoos, Zoological Parks, Wildlife Sanctuaries, National Parks and Tiger Reserves.

Unit I:

Wildlife Management: Basic concepts and principles – Wildlife management before and after implementation of Wild Life (Protection) Act, 1972 – IUCN – CITES – NBA – IBA – Project Tiger – Project Elephant – Project Crocodile

Unit II:

Evaluation of Wildlife habitat: Define habitat Forest habitat types – basic survey techniques of habitats – Vegetative analyses – Point centered quadrat, Quadrat, strip transect – Habitat manipulation: Food, Water, shade, impact and removal of invasive alien species

Unit III:

Population Estimation: Basic concepts and applications – Direct count (block count, transect methods, Point counts, visual encounter survey, waterhole survey)–Indirect count (Call count, track and signs, pellet count, pugmark, camera trap, DNA finger printing and aerial photography).

Unit IV:

Human–animal Conflicts: Basic concepts, reason for conflicts – Identification of damages caused by wild animals and control measures – Case studies : Elephant, gaur, wild boar, monkey, tiger and leopard –Translocation of Wild animals – Principles, Methods and application.

Unit V:

Zoos, Zoological Parks, Wildlife Sanctuaries, National Parks and Tiger Reserves: Definition – in-situ and ex-situ conservation, formation, management and administration – Case studies VOC park zoo – Arignar Anna Zoological Park –Srivilliputtur Wildlife Sanctuary –Vedanthangal bird sanctuary – Mukkuruthi–Guindy National Parks–Mudumalai and Periyar Tiger Reserves –Nilgiri Biosphere Reserve.

Total	Local	Region	National	Global
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topics				
35	12	2	11	10

Text Book:

1. Saharia, V.B. 1982 Wildlife in India, Nataraj Publishers, Dehra Dun
2. Seshadri, B.1986 India's Wildlife reserves , Sterling Pub'rsPvt. Ltd., New Delhi
3. Giles, R.H. Jr. (Ed) 1984. Wildlife Management Techniques 3rd edition. The wildlife Society, Washington. D.C. NatarajPublishers,Dehradun. India

Books for References:

1. Dasmann, Rf. 1964, Wildlife Biology. John and Wiley and sons Newyork. Pp231.
2. Robinson, Wl. and Eric, G. Bolen, 1984. Wildlife Ecology and Management Mac Millan Publishing Co, Ny. Pp 478.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	22UZO5MBE1:2	Wild life conservation and Management					5	5			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓		✓			✓	✓	✓	✓	
CO2	✓	✓	✓		✓		✓	✓	✓	✓	
CO3	✓	✓	✓		✓	✓	✓	✓	✓	✓	
CO4	✓	✓		✓			✓	✓	✓	✓	
CO5		✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 37 Relationship: High											

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – V

Course code:22UZ05MBE1:3

Instruction: Hours: 5

Credit: 5

Exam Hours: 3

Internal Marks: 25

External Marks: 75

MAJOR BASED ELECTIVE

FOOD AND NUTRITION

Objective:

To create awareness on food nutrition and health

Course Outcomes:

On completion of the course students will be able

- Appreciate the relationship between food, nutrition and health.
- Explain digestion, absorption, functions and food sources of various nutrients.
- Understand the concept of balanced diets and menu planning.
- Describe different methods of cooking and ways to prevent nutrient losses.
- Plan and prepare meals and nutritious dishes for various age groups and assess nutritional status of adults.

Unit 1

Introduction to Food and Nutrition: Basic terms used in study of food and nutrition – Methods of assessment of nutritional status–Functions of food–physiological–psychological –social – Understanding relationship between food, nutrition and health.

Unit II

Nutrients: Classification– digestion – absorption– functions– dietary sources– RDA (Recommended Dietary Allowance) –clinical manifestations of deficiency – excess of the following in brief: Energy– Carbohydrates– lipids – proteins

Unit III

Vitamins: Fat soluble vitamins–A, D, E and K – Water soluble vitamins – thiamine, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C –Minerals:calcium, iron, iodine, fluorine, copper and zinc– Deficiency of vitamin A.

Unit IV

Planning Balanced Meals and Selection of Healthy Foods: Food Groups– Concept of Balanced Diets – Mal nutrition– Healthy and Fad Diets –Factors affecting meal planning–Nutrition methods –improving physical fitness.

Unit V

Methods of Cooking and Nutrient Retention: Dry, moist, frying and microwave cooking –Advantages, disadvantages–Effect of various methods of cooking on foods and nutrients–Preventing nutrient losses.

Total topics	Local	Region	National	Global
33	1	1	1	30

Text Book

- Bamji MS, Krishnaswamy K, Brahmam GNV (2016). *Textbook of Human Nutrition*, 4th edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.

Books for References

- Chadha R and Mathur P eds. (2015). *Nutrition: A Lifecycle Approach*. Hyderabad: Orient Blackswan.
- Longvah T, Ananthan R, Bhaskarachary K and Venkaiah K. (2017). *Indian Food Composition Tables*. National Institute of Nutrition, Indian Council of Medical Research, Department of Health Research, Ministry of Health and Family Welfare, Government of India, Hyderabad.
- Seth V, Singh K, Mathur P. (2018). *Diet Planning Through the Lifecycle Part I: Normal Nutrition– A Practical Manual*. 6th Edition. Delhi: Elite Publishing House.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	22UZO5MBE1:3	Food and Nutrition					5	5			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓		✓			✓	✓	✓		
CO2		✓	✓		✓		✓	✓	✓		
CO3	✓	✓	✓		✓	✓	✓	✓	✓	✓	
CO4	✓	✓		✓			✓	✓	✓	✓	
CO5		✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 34 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – V

U.G. Dept. of Zoology, Thanthai Hans Roever College (Autonomous), Perambalur – 621 220. (Syllabus 2022– 2023 onwards)

Course code:22UZO5SBE2:1
Instruction: Hours: 5
Credit: 4

Exam Hours: 3
Internal Marks: 25
External Marks: 75

SKILL BASED ELECTIVE
APICULTURE

Course Objectives

Understand the basic life cycle of the honeybee, Learn about beekeeping tools and equipment.
Learn to manage beehives for honey production and pollination. Learn about bee diseases and pests.

Course Outcomes:

- Encourage Students' participation in scientific beekeeping.
- Maintain ecological balance in nature by way of domestication of honey bee species.
- Maintain small apiaries for demonstration, pollination, extraction and popularization of honey and other by-product of beekeeping.
- Motivation of students to adopt beekeeping as source of their livelihood.

UNIT – I: Introduction

Scope of Apiculture –Types of Honey Bees– Life Cycle. Species of Honey bees –Apis dorsata, Apis indica, Apis florea and Apis mellifera.

UNIT –II: Social Organization

Social Organization of Honey Bee– drones, queens, and workers –Bee Language and communication –Temporal Polyethism, Superorganisms, Dancing, Swarming.

UNIT – III: Bee Keeping and Bee Keeping Equipment

Beehive, Tools for Bee Keeping: Comb foundation– Bee gloves– Bee veil – Smoker – Hive tool –Honey extractor.

UNIT – IV: Products of Apiculture

Honey–Chemical composition–Nutritional value and medicinal value – Testing Methods to find adulteration in honey Production of Bee wax and Uses – Bee venom and Uses.

UNIT – V: Bee enemies and Diseases

Bee enemies: Insects – Reptiles – birds – Mammals – Bee Diseases: Nosema, Acarine, Septicemia, Brood Foul, Isle of Wight and Amoeba disease.

Total topics	Local	Region	National	Global
24	13	4	4	3

Text Book:

1. Kumar, A. and Nigam, P. M., Economic and Applied Entomology
2. Backyard Beekeeping– Kim Flottum, ed. of Bee Culture magazine

Books for References:

1. First Lessons in Beekeeping– Keith Delaplane
2. Hooray for Beekeeping– Bobbie Kalman

3. How to Keep Bees and Sell Honey – Kelleys
4. The Hive & the Honeybee – Dadant

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	22UZO5SBE2:1	Apiculture					2	2			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1		✓		✓			✓	✓	✓	✓	
CO2	✓	✓	✓		✓		✓	✓	✓	✓	
CO3	✓	✓	✓		✓	✓	✓	✓	✓	✓	
CO4	✓	✓		✓			✓	✓	✓	✓	
CO5		✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 36 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – V

U.G. Dept. of Zoology, Thanthai Hans Roever College (Autonomous), Perambalur – 621 220.(Syllabus 2022– 2023 onwards)

Course code:22UZ05SBE2:2
Instruction: Hours: 2
Credit: 2

Exam Hours: 3
Internal Marks: 25
External Marks: 75

SKILL BASED ELECTIVE
VERMITECHNOLOGY

Objective

To understand the economic importance of earthworms, to imbibe skills in establishing vermiculture unit

Course Outcomes:

On completion of the course students will be able

- To understand the principles of site selection for vermiculture.
- To describe different types of vermi-bed practices.
- To know the criteria for vermiculture species selection and water quality management.
- To describe nutritional requirements and feed formulation for vermiculture organisms
- To acquire knowledge of vermicomposting in Agriculture and Horticultural practices

Unit I VERMICOMPOSTING AGENTS

History of Indian Earthworm culture – Need for Vermiculture– Earthworm types – Biology of *Lampitoma* and *Eudriluseugeniae* – Trophic classification of Earthworm: Epigeic, Anecic & Endogenic; Clitellates & Non-Clitellates – Morphology, Anatomy and Physiology of Earthworms – Life cycle of Earthworm – Role of Earthworms in composting.

Unit II VERMITECHNOLOGY

Raw materials and requirements of vermicomposting – Worms for Vermiculture – Vermiculture practice – Vermibed preparation– Maintenance of composting – Collection of vermicompost – Efficiency of vermicompost.

Unit III VERMICOMPOST PROPERTIES

Types of Vermicomposting – Worm casts – General problems in production of vermicompost– Physical, Chemical and Biological properties of Vermicompost– Effects of vermicompost on soil properties – Vermiwash unit.

Unit IV VERMICOMPOST APPLICATION (USES OF EARTHWORM)

Advantage of vermicomposting – Vermicomposting from Agricultural and Urban Solid Wastes – Recycling of wastes through vermicomposting – Earthworms as Bioreactors and Bio indicators– Organic farming –Vermicomposting and its applications.

Unit V VERMICOMPOSTING POTENTIALS & ECONOMICS

Small Scale or Indoor vermicomposting – Large scale or outdoor vermicomposting.
 Vermicomposting – Quality & Economics – Role of Earthworm in sustainable Agriculture –
 Prospects of vermiculture as a self-employment venture.

Total topics	Local	Region	National	Global
34	0	23	6	5

Text Books:

1. Sultan Ahmed Ismail. The Earthworm, Others India Press, Mapura 403507, Goa, India. 2005.
2. Seethalakshmy. A Text book of Vermitechnology, Saras Publications. 3rd Edition, 2012.
3. Prakash Malhotra (2008). Economic Zoology, Adhyayna Publishers & Distributors, New Delhi.

Book for Reference:

1. NIIR Board, The complete Technology Book on Vermiculture and Vermicompost. 2006, New Delhi.
2. Edwards C.A and Bater, B. 1996. Biology of Earth worms. Chapman and Hall. London. Ismail, S.A. 1997.
3. Vermicology– The Biology of Earthworms. Orient Longman. India.
4. Ranganathan L.S. 2006. Vermibiotechnology from soil health to human health. Agrobios India.
5. Gupta P.K. 2008. Vermicomposting for sustainable agriculture. Agrobios. India.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	22UZO5SBE2:2	Vermitechnology					2	2			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1		✓		✓				✓	✓	✓	
CO2	✓	✓	✓		✓		✓	✓	✓	✓	
CO3	✓	✓	✓		✓	✓	✓	✓	✓	✓	
CO4	✓	✓		✓			✓	✓	✓	✓	
CO5		✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 35 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – V

Course code:22UZO5SBE2:3
Instruction: Hours: 2
Credit: 2

Exam Hours: 3
Internal Marks: 25
External Marks: 75

SKILL BASED ELECTIVE

AQUACULTURE

Objective:

To study the economic importance of aquaculture and acquire skills in establishing Fish farm.

Course Outcomes:

On completion of the course students will be able

- Explain the concepts of fisheries.
- Gain the knowledge about freshwater fish culture and marine aquaculture like oyster, shrimp etc.,
- Comparative analysis of aquaculture.
- Imparts the techniques of fish culture and disease managements.
- Explore the fish marketing and quality control norms.

Unit I IMPORTANCE OF AQUACULTURE

Importance of aquaculture – Over exploitation of wild fish stocks – advantages of aquaculture – Aquaculture production trends in the world and in India– Scope for aquaculture in India– Basic fish farm design – selection of site, grow – out and nursery ponds.

Unit II CULTIVABLE SPECIES

Cultivable species of fishes– crustacean–mollusks – algae – Culture systems: Extensive –intensive and semiintensiveculture –composite fish culture – Integrated farming – Advantages of polyculture – monoculture –monosex

Unit III CULTURE OF CARP, OYSTER AND PRAWN

Culture of carp species oyster culture: pearl oyster – Prawn culture: the problems in penaeid prawn (shrimp) culture due to socio-economic and environmental problems – Freshwater prawn culture – Potential for ornamental fish culture– Common species for ornamental fish culture.

Unit IV FISH DISEASE MANAGEMENT

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

Unit V MARKETING

Marketing the products: Marketing the fish to local markets and for export– Harvesting and transport – Canning and freezing.

Total topics	Local	Region	National	Global
33	4	12	6	11

Text book:

1. Rath, R.K. (2000) Freshwater Aquaculture. Scientific Publishers (India), Jodhpur.
U.G. Dept. of Zoology, Thanthai Hans Roever College (Autonomous), Perambalur – 621 220.(Syllabus 2022– 2023 onwards)

2. N. Arumugam, (2005) Aquaculture Saras Publication
3. Jhingran, A.V.G. (1991) Fish and Fisheries of India. Hindustan Publishing Co., New Delhi.
4. Baradach, J.E. J.H. RYTHER & WO M.C. LARNEY (1972) Aquaculture. The Farming and Husbandry of Freshwater and Marine Organisms. Wiley Inter Science, New York.

Books for references:

1. Fish and Fisheries in India, Jhingran,V.G., 1982, Hindustan Publishing Corporation, NewDelhi
2. Principles and practices of Pond Aquaculture, Annan, J.F, R.O.Smiterman and G. Tehebenoglous (Eds) ,1983 ,Oregon State University , U.S.A.
3. Home Aquarium:aquaticgema and tropical fish ,1970, Makinos Japan Publications

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	22UZO5SBE2:3	Aquaculture					2	2			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1				✓				✓	✓	✓	
CO2	✓	✓	✓		✓		✓	✓	✓	✓	
CO3	✓	✓	✓		✓	✓	✓	✓	✓	✓	
CO4	✓	✓		✓			✓	✓	✓	✓	
CO5		✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 34 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – V

Course code:22UZO5SBE3:1

Instruction: Hours: 2

Credit: 2

Exam Hours: 3

Internal Marks: 25

External Marks: 75

SKILL BASED ELECTIVE

HEALTH EDUCATION

Objective:

To create awareness on health.

Course Outcomes

On completion of the course students will be able

- To understand the principle and types of food.
- To describe different types of pollution.
- To know the preventive methods agents air and water born diseases.
- To describe nutritional requirements and feed for good health
- To acquire knowledge about Mental health

Unit I

Health: Definition – Dimensions of health– Health education: Definition– principles – Nutrition and health: Balanced diet– macronutrients –micronutrients – vitamins and minerals. –Food hygiene: perishable – nonperishable –shelf life – sterilization – food poisoning.

Unit II

Environment and Health: Water– Air – Noise pollution– Pollutants: Effects,prevention – control. Effects of smoking and alcoholism – Causes effects and control measures of Life style diseases: Stroke – Obesity – type 1 diabetes–type 2 diabetes

Unit III

Concept of disease: Phases of disease – Prepathogenesis– Pathogenesis –concept of prevention – control – Common Helminthic– Arthropod borne diseases –Immunity: Types of vaccinations – Live – Attenuated – Killed – Toxoid –Transgenic vaccines.

Unit IV:

Air and Water Born Diseases:Bacterial and Viral diseases – Causative agents and factor– Mode of transmission: air – water – droplets – contact – Symptoms and treatment of Tuberculosis – Typhoid – Hepatitis A and B – Cholera – dysentery –gastroenteritis.

Unit V

Mental Health: Definition, characteristics – causes and prevention of mental health – Occupational health & hazards, prevention– Health care services – Primary health care – **Hospitals** – Principles of First Aid – **First aid procedures for Accidents, food poisoning, snake bites** and heart attacks.

Total topics	Local	Region	National	Global
49	7	4	10	28

Textbook:

1. E. Park and Park: Textbook of Preventive and Social Medicine (Published by BanarsidasBhanot, 1st Edition, 1278 Napier Town.)
2. Leelavathy. S. Nair, Revised enlarged edition. A Text book of Invertebrates, Saras Publications. 2001

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	22UZO5SBE3:1	Health Education					2	2			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1				✓		✓	✓	✓	✓	✓	
CO2		✓	✓		✓		✓	✓	✓	✓	
CO3		✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO4	✓	✓		✓			✓	✓	✓	✓	
CO5	✓	✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 38 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – V**Course code:22UZO5SBE3:2****Instruction: Hours: 2****Credit: 2****Exam Hours: 3****Internal Marks: 25****External Marks: 75**

SKILL BASED ELECTIVE

POULTRY SCIENCE

Objective:

To acquire skills in establishing poultry farm,

Course Outcomes:

On completion of the course students will be able

- To know the habitat, food and feeding of fowls.
- They will understand the breeding and rearing of chickens, even about the disease and products of poultry.
- Students will also know about the planning and construction of poultry farm, which will help them to start-up with small scale poultry farm.
- Students will understand the economic importance of breeds with global perspective.
- Students will understand about the equipments, management, pest, predators and disease of chicks

UNIT I INTRODUCTION

Poultry industry in India – Scope and objective – Poultry breeds and classes of fowls –General principle of building Poultry house – Poultry housing: Deep litter and cage rearing – Poultry equipments.

UNIT II CULTURE PRACTICE

Rearing of fowls – Methods of rearing chicks– growers – layers and broilers – Growth and management of fowls in summer and winter – Lighting and debeaking – Culling of the flock.

UNIT III POULTRY NUTRITION

Poultry nutrition – Nutritional requirement of fowls – Composition of feed – Feed formulation – Nutrition deficiency symptoms – Non nutritive feed additives – Quality Control.

UNIT IV DISEASE MANAGEMENT

Poultry diseases – Viral Disease:Ranikhet disease – Fowl pox –Bacterial Disease:Salmonellosis– Fowl Cholera – Parasitic Diseases: Coccidiosis – Ticks – Vaccination programme – Prevention and Precaution for diseases – Fowl health products.

UNIT V POULTRY PRODUCTS

Poultry products – Composition and nutritive value of eggs – Role of egg in human nutrition – Poultry meat processing – Marketing of poultry products – Use of feathers – Poultry manure– Economics of poultry keeping– Field visit – Plan to promote Poultry Keeping for Employment Venture.

Total topics	Local	Region	National	Global
40	18	13	6	3

Text books:

1. M.R. Gnaanamani .Poultry Keeping, GIRI Publication, Madurai. 2003.
2. Shukla. Upadhya Economic Zoology. 2005.
3. Jull Morley,A.1971: Poultry Husbandry, Tata – McGraw Hill Publ. Co New Delhi.
- 4 .A text book of Animal Husbandry – Banerjee G.C. Oxford and IBH publishing Co Pvt. Ltd., New Delhi. 8thEdition

Books for Reference:

1. The Rearing of Pullets – Bulletin No. 54, Her Majesty’s stationary office, London.
2. Intensive Poultry Management for Egg Production. Bulletin No. 152. Her Majesty’s Stationary office London.
3. Nutrition of the Chicken – M.L.Scott et al.
4. Diseases of Poultry – Biester – Oxford & IBH.
5. Modern aspects of commercial Poultry keeping. Gnanamani A.R. Giri Publication, Madurai.
6. Poultry keeping in India. Naidu P.M.N. Indian Council of Agricultural Research, New Delhi

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	22UZO5SBE3:2	Poultry farming					2	2			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1				✓		✓	✓	✓	✓	✓	
CO2			✓		✓		✓	✓	✓	✓	
CO3			✓	✓	✓	✓	✓	✓	✓	✓	
CO4	✓			✓			✓	✓	✓	✓	
CO5	✓	✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 35 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – V

Course code:22UZO5SBE3:3

Instruction: Hours: 2

Credit: 2

Exam Hours: 3

Internal Marks: 25

External Marks: 75

SKILL BASED ELECTIVE

DAIRY TECHNOLOGY

Objective:

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To understand the importance of Industrial Zoology and acquire skills in establishing dairy technology.

Course Outcomes:

On completion of the course students will be able

- To understand status of Dairy industry and the role of cooperative societies.
- To explore the importance of Livestock to agriculture and its relation to national economy.
- To know about the different breeds of buffalos and cows.
- To know about the management, control of parasites, bacterial and viral disease of livestock's.
- To know about the causative agent of different types of microbial diseases and its control measures.

Unit I

Dairy farming – Definition – Scope – Role of Co-operative societies in milk production – marketing–General dairy farm practices– identification, dehorning, castration, exercising, grooming, weighing. Care of animals at calving and management of neonates.

Unit II

Dairy breeds of India and its classification – Exotic cow breeds – Jersey and Red sindhi– Indian breeds – Kangayam– Buffalo – Murrah–dual propose cattle system (DPS)

Unit III

Feed and Nutrition–Feed nutrients required by animal body. – Feed resources for milk production and their nutritive values – Measures of feed energy.Nutrients requirements for growth and milk production.Feeding standards.

Unit IV

Milk – Composition – Nutritive value – Pasteurization of milk– Milk products – Butter, Ghee, Cheese.

Unit V

Bacterial diseases – Anthrax, Mastitis–Viral diseases – Foot and mouth disease– Non-contagious disease – Milk fever

Total topics	Local	Region	National	Global
33	3	6	17	7

Textbook:

1. Hand book of Dairy farming to produce milk with packaging. EIRI.
2. Banerjee G.C. A text book of Animal Husbandry Oxford and IBH publishing Co Pvt. Ltd., New Delhi. 8th Edition.

Books for References:

1. IbraheemKutty C. and SheebaKhamer, Milk Production and processing. Daya publishing House, Delhi, 2014.
2. The complete technology book on Dairy and Poultry industries with farming and processing. National Institute of Industrial Research Board, Delhi. 2012.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course	Hours	Credits
V	22UZO5SBE3:3	Dairy technology	2	2

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓		✓		✓	✓	✓	✓	✓
CO2	✓		✓		✓		✓	✓	✓	✓
CO3			✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓			✓			✓	✓	✓	✓
CO5	✓	✓	✓		✓	✓	✓	✓	✓	✓
Number of Matches(✓) =37 Relationship: High										

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – VI

Course code: 22UZO6CC8
Instruction: Hours: 6
Credit: 6

Exam Hours: 3
Internal Marks: 25
External Marks:75

CORE COURSE VII: DEVELOPMENTAL BIOLOGY

Objective:

To study the process of fertilization and development. And understand the post embryonic developmental events.

Course Outcomes:

On completion of the course students will be able.

- The learner to understand methodological approaches to the study of embryonic development and the characteristics of the principal experimental models. The students to identify embryonic structures in preparations, photographs and diagrams.
- The students to develop an idea, how to arrange sequences in developmental processes in order.
- The learner to understand the derivatives of embryonic structures.
- 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.
- The students will be able to explain the clinical implications of development and the mechanisms that intervene in developmental alterations.

Unit I

Gametes and Fertilization

Basic concepts of developmental biology–Structure of mammalian Spermatozoa–Structure of egg – Egg membranes– Patterns of egg – organization of egg – origin of polarity –Spermatogenesis – Oogenesis– Fertilization – mechanism– theories and significance – Parthenogenesis.

Unit II

Blastulation and Gastrulation

Cleavage – Planes and Patterns– Factors controlling cleavage – Fate map and its construction– Blastulation – Morphogenetic movements – Gastrulation of frog – chick.

Unit III

Organogenesis

Development of Brain, Eye – Heart in frog– Development of Nervous system in chick– Foetal membranes in chick – Development of Pro, Meso, Metanephric kidneys.

Unit IV

Applied Embryology

Organizer concept –Structure – mechanism of induction and competence– Nuclear transplantation – teratogenesis – Regeneration: types – events and factors –Embryonic stem cells – significance.

Unit V

Embryological Techniques

Ostrous– Pregnancy – trimesters – development–Erythroblastosisfoetalis–Twins – types– Infertility – causes – Test tube baby – Assisted Reproductive Technology – Embryo transfer – Amniocentesis.

Total topics	Local	Region	National	Global
47	0	0	0	47

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Textbook

1. Arumugam NA. 2012. Text Book of Embryology, Biotechnology Saras Publication Nagercoil.
2. Balnisky BI. An Introduction to Embryology, W.B. Saunders and Co.
3. Berril N J, Kars G (1986). Developmental biology, McGrawHills

Books for reference

1. Gilbert SF (2010). Developmental Biology, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
2. Majumdar NN Vertebrate embryology; Tata McGraw–Hill, New Delhi.
3. Verma PS and Agarwal VK Chordate Embryology, S. Chand Publishers, New Delhi.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
VI	22UZO6CC8	Developmental Biology					6	6			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓			✓	✓	✓	✓	✓	✓	
CO2			✓	✓	✓	✓		✓	✓	✓	
CO3	✓				✓		✓	✓	✓	✓	
CO4			✓	✓	✓	✓	✓	✓	✓	✓	
CO5		✓		✓	✓	✓	✓	✓	✓		
Number of Matches(✓) = 36 Relationship:											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER VI

Course code: 22UZO6CC9
 Instruction: Hours: 6
 Credit: 6

Exam Hours: 3
 Internal Marks: 25
 External Marks: 75

CORE COURSE IX: ORGANIC EVOLUTION

Objective:

To understand the importance of environment, its protection and conservation.

Course Outcomes:

On completion of the course students will be able.

- Students to describe the history and development of evolutionary thought list and describe the evidence for evolution and its required corollaries and mechanisms by which evolution occurs.
- Students to describe the history of life on earth.
- Students to explain how speciation occurs and reasons for extinction.
- Students can make knowledge of how major vertebrate forms evolved in the earth.
- To gain an idea of the distribution of the various faunal components.

Unit I

Evidences of Evolution

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

Unit II

Theories of Organic Evolution

Lamarckism– Neo Lamarckism – Darwinism – Neo Darwinism – Mutation theory – New version of mutation theory – Modern Synthetic theory of evolution.– Natural selection – Convergent –Divergent evolution.

Unit III:

Adaptation and Isolation

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

Unit IV

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 and Mesozoic era; up to epoch for Cenozoic era).

Unit V

Evolution of Higher forms

Evolutionary significance of Dipnoi – Origin of Amphibians – Golden age of Reptiles – Major types of Dinosaurs – reason for extinction –Affinities of Archaeopteryx – Outlines of evolution of Man – Horse– Dating of fossils –connecting links – living fossils.

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Total topics	Local	Region	National	Global
41	0	0	0	41

Textbook:

1. Verma PS, and Agarwal VK Cell Biology, Genetics, Evolution and Ecology, S Chand and Co Publishers, New Delhi.
2. Gupta PK, Cytology, Genetics and Evolution, Rastogi Publications, Meerut.
3. Arumugam N Organic Evolution, Saras Publication, Nagercoil.

Books for references

1. Barton NH, Briggs DEG, Eisen JA, Goldstein DB and Patel NH, *Evolution*. Cold Spring, Harbour Laboratory Press.
2. Hall BK and Hallgrimsson B, *Evolution*, Jones and Bartlett Publishers.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits				
VI	22UZO6CC9	Organic Evolution					6	6				
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1			✓	✓	✓	✓		✓	✓	✓		
CO2	✓			✓	✓	✓	✓	✓				
CO3	✓	✓	✓	✓		✓		✓	✓	✓		
CO4			✓	✓	✓	✓		✓	✓	✓		
CO5		✓	✓	✓	✓		✓	✓	✓	✓		
Number of Matches(✓) = 35 Relationship:												

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – VI

Course code: 22UZO6CP6
Instruction: Hours: 5
Credit: 3

Exam Hours: 3
Internal Marks: 40
External Marks:60

CORE PRACTICAL VI

DEVELOPMENTAL BIOLOGY AND ORGANIC EVOLUTION

Objective:

- To elucidate the segmental changes in pattern, development and organization of
- The developing embryo and to highlight the interaction of cells and their role in fetal formation.
- Wealth of our natural resources and conservation measures to be taken and create awareness of the laws governing environment.

Course Outcomes:

- Be able to list the types of characteristics that make an organism ideal for the study of developmental biology.
- Be familiar with the events that led up to fertilization.
- Be able to describe the first four rounds of cell division in different groups.

Developmental Biology

1. Observation of the structure of live spermatozoa of Bull.

2. Observation of prepared micro slides to study:

a. Egg, cleavage, blastula and yolk plug stage in frog.

b. Egg, 24 hrs, 36 hrs, 48 hrs, 72 hrs and 96 hrs

3. Metamorphosis of frog

4. Hen's egg

5. Human ovum – Sperm.

Evolution

1. Animals of evolutionary importance: Peripatus, Limulus, Archaeopteryz.

2. Homologous organs: Forelimbs of Frog.

3. Analogous organs: Wings of Insects and Birds.

4. Fossils: Trilobite, Nautilus – Sphenodan

5. Mimicry: Leaf insects, Stick insects, Monarch and Viceroy butterfly.

6. Colouration: Chameleon, Lycodon.

Total topics	Local	Region	National	Global
12	6	0	0	6

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
VI	22UZO6CP6	Developmental Biology and Organic Evolution (P)					5	3			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓			✓	✓	✓	✓	✓		
CO2	✓		✓	✓		✓	✓			✓	
CO3			✓	✓	✓		✓	✓	✓	✓	
CO4		✓	✓		✓	✓	✓	✓		✓	
CO5	✓	✓		✓		✓		✓	✓	✓	
Number of Matches(✓) = 34 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – VI

Course code:22UZO6MBE2:1

Instruction: Hours: 6

Credit: 5

Exam Hours: 3

Internal Marks: 25

External Marks: 75

MAJOR BASED ELECTIVE

BIOCHEMISTRY AND BIOPHYSICS

Objective:

To understand the basic principles of Biochemistry, Bio physics and Metabolism

Course outcomes:

On completion of the course students will be able

- Able to familiarize the instrumental principles and their techniques
- Learn the types of cell communication and the structures associated.
- Describe the structures and various cellular functions associated with the macromolecules found in cells.
- Learn the principles and mechanism of protein synthesis.
- To acquire advanced knowledge of molecular biology of prokaryotes, and eukaryotes.

Unit –I

Biochemical Compounds

Structure of Atoms, Molecules – chemical bonds – stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, Electrostatic Force) – Biological Importance of Water, pH and Buffers.

Unit –II

Biomolecules I

Carbohydrates – Classification, structure, function, properties – Metabolism of carbohydrates: TCA Cycle – Glycolysis – Gluconeogenesis – HMP Shunt – glycogenolysis Proteins – Classification – Structural organization of proteins (Primary, secondary, tertiary and quaternary structures) – Amino acids: Definition, Classification, properties,

Unit –III

Biomolecules II

Lipids: Classification, structure, function, properties of simple and compound Lipids – Biological importance of sterols, cholesterol – Bile acids – Fatty acid Biosynthesis – Beta oxidation of fatty acids.

Unit –IV

Nucleic Acids and Enzymes

Nucleic acids: Composition – Properties of nucleic acids – Enzymes – Definition, Classification and functions of enzymes – Co-enzymes – Iso-enzymes – Allosteric enzymes – Abzymes – Bioenergetics, oxidative phosphorylation – coupled reaction – group transfer – **biological energy transducers.**

Unit – V

Biophysical Techniques

U.G. Dept. of Zoology, Thanthai Hans Roever College (Autonomous), Perambalur – 621 220. (Syllabus 2022– 2023 onwards)

Separation Methods – Sedimentation – Chromatography methods –Chromatography and their types– Spectroscopes–Introduction and applications of FTIR – Mass spectroscopy – Nuclear Magnetic Resonance (NMR); Radiation Bio physics – Introduction and medical applications.

Total topics	Local	Region	National	Global
42	1	0	0	41

Textbook:

1. Satyanarayana,U, (2015), Essentials of Biochemistry, Books and Allied (P) Limited, Kolkata.
 2. AvinashUpadhyay, KakoliUpadhyay and NirmalenduNath, (2019), Biophysical Chemistry, HimalyaPublkications
 3. Satyanarayana, U and Chakrapani, U (2009), Essentials of Biochemistry, Books and Allied (P) Limited, Kolkata.
 4. Jain, J.L. (2007), Fundamentals of Biochemistry, S. Chand and Co. Ltd., New Delhi.
- Department of Zoology M.Sc020., Syllabus – 2018 – 2

Books for references:

1. Stryer, L. (2006), Biochemistry, W.H. Freeman and Co., New York.
2. Chatterjee, H.N. and Spindle, R. (2005), Text Book of Medical Biochemistry, Jaypee Brothers, New Delhi.
3. Nelson, D.I. and Cox, M.M. (2004), Lehninger Principles of Biochemistry, III Edition, Mac Millon Worth Publishers, New York.
4. Devlin, T.M. (2003), Biochemistry, Wiley–Liss, New York.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course	Hours	Credits
VI	22UZO6MBE2:1	Biochemistry and Biophysics	6	5

U.G. Dept. of Zoology, Thanthai Hans Roever College (Autonomous), Perambalur – 621 220.(Syllabus 2022– 2023 onwards)

Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓		✓	✓	✓		✓		✓	✓
CO2		✓			✓		✓	✓		✓
CO3	✓		✓	✓		✓	✓		✓	
CO4		✓		✓	✓	✓		✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 35 Relationship: High										

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – VI

Course code:22UZO6MBE2:2

Instruction: Hours: 6

Credit: 5

Exam Hours: 3

Internal Marks: 25

External Marks: 75

MAJOR BASED ELECTIVE

PARASITOLOGY

U.G. Dept. of Zoology, Thanthai Hans Roever College (Autonomous), Perambalur – 621 220.(Syllabus 2022– 2023 onwards)

Objective:

To understand the studs of parasitology.

Course Outcomes:

On completion of the course students will be able

- Understand the biology behind host–parasite interactions
- Learn about epidemiological concepts of parasitic infections of global importance
- Trained to diagnose, identify and detect some important parasites
- Learn pathological changes associated with parasite infections
- Discuss the role of vectors and intermediate hosts in parasite transmission

Unit I

General concepts: Animal associations and evolution of host – Parasite relationship – Immune response and self–defense mechanisms – immune evasion and biochemical adaptations of parasites – Zoonosis.

Unit II

Leishmaniasis: Sand fly biology in the life cycle of Leishmania parasites – critical role for sand fly midgutmicrobiota in Leishmania – development and transmission – epidemiology – detection – protective and pathologic immune responses in leishmaniasis – immune evasion mechanisms – drug targets – mechanism of drug resistance – vaccine strategies.

Unit III

Sleeping sickness: Epidemiology – mode of infection – serum resistance in zoonotic trypanosomes – immunity and immune evasion mechanisms – dynamics of antigenic variation and VSG iversification – drug targets –mechanism of drug resistance – vaccine strategies.

Unit IV

Gastro–intestinal and other parasites: Amoebiasis–Epidemiology –Detection – immunity and immune evasion mechanisms – drug targets – mechanism of drug resistance – vaccine strategies – Schistosoma – Wuchereria, Brugia – Ancylostoma – Trichinella – Dracanculus – Epidemiology– mode of infection – detection – immunity and immune evasion mechanisms – drug targets – mechanism of drug resistance – vaccine strategies.

Unit V

Beyond humans: Parasites of veterinary importance – Parasitic insects – mites – ticks – parasites of insects and their significance – nematode parasites– morphology – biology,lifecycle and infection of crop plants by major plant parasitic nematodes – host parasite interactions.

Total topics	Local	Region	National	Global
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50		0	0	50

Textbook:

1. Modern Parasitology: A Textbook of Parasitology, FEG Cox., Wiley–Blackwell, U. K.
2. Parasitology: A Conceptual Approach, Eric S. Loker, Bruce V. Hofkin

Books for references

1. Foundations of Parasitology, Roberts L.S. and Janovy J., McGraw–Hill Publishers, New York, USA.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
VI	22UZO6MBE2:2	Parasitology					6	5			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1		✓	✓		✓		✓	✓	✓	✓	
CO2	✓				✓	✓	✓	✓	✓	✓	
CO3		✓		✓	✓	✓		✓	✓	✓	
CO4			✓	✓		✓	✓		✓	✓	
CO5	✓	✓	✓	✓	✓		✓	✓		✓	
Number of Matches(✓) = 35 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – VI

Course code:22UZO6MBE2:3

Instruction: Hours: 6

Credit: 5

Exam Hours: 3

Internal Marks: 25

External Marks: 75

MAJOR BASED ELECTIVE

INSECT PEST MANAGEMENT

Objective:

To create awareness on insect vectors and diseases

Course Outcomes:

On completion of the course students will be able

- To describe the economic classification of insects.
- To understand the types of insect development.
- To know pests of stored products and their control.
- To describe pest control methods and application.
- To understand the production and marketing of pesticides.

Unit I

Introduction: economic classification of insects – Types of pests – crawling pest – flying insect rodents and others– types of damage Caused by pests in crops – causes for insects assuming pest status – outbreak of pests.

Unit II

Types of insect development: ametabola – metabola (hemi metabola, holometabola, paurometabola and hypermetabola) – Pests of agricultural importance – their bionomics – life cycle and control measures of paddy – ground nut – cotton – tomato – maize – coffee – Banana.

Unit III

Pests of stored products and their control: Household pests – cockroach and termites , and their control – pest in relation to public health – rodents and their control – Mosquito borne diseases and their control measures.

Unit IV

Pest control methods and application: cultural, mechanical, biological and chemical methods – classification of pesticides – LC 50 and LD 50 values – First Aid and precautions in handling pesticides – pesticide spraying appliances – Residual effects of pesticides on non-target organisms.

Unit V

Pesticide industry: production and marketing – recent trends in pest control – pheromones, attractants, repellants and chemosterilants – **Integrated pest management, its importance & applications.**

Total topics	Local	Region	National	Global
33	0	1	18	16

Textbook:

1. Vasantharaj David and T. Kumaraswami 1988. Elements of Economic Entomology Popular Book Depot, Chennai.
2. Nayar, K.K., Ananthkrishnan, T.N. and B.V. David 1992 General and Applied Entomology Tata McGraw, New Delhi.
3. P.G. Fenemore and Alka Prakash 1997 Allied Entomology, Wiley Eastern Ltd., New York.

Books for Reference:

1. Wigglesworth J.B., 1994. Insect Physiology, Chapman and Hall, London.
2. Temphare D.B., 1984 A. Text Book of Insects Morphology, Physiology and Endocrinology. S. Chand and Co., New Delhi.
3. A.Upadhyaya, K.Upathyaya and N.Nath, 2003 Biophysical chemistry, Principles and Techniques, 3rd Ed, Himamalaya publishing house.
4. H.B.Bull, F.H.Davis, 1971. An introduction to physical Biochemistry 2nd Ed, Philadelphia
5. Gurumani.N 2006. Research methodology for biological sciences MJP publ. Chennai.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
VI	22UZO6MBE2:3	Insect Pest Management					6	5			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1		✓		✓	✓		✓	✓	✓	✓	
CO2			✓	✓	✓	✓	✓	✓	✓	✓	
CO3	✓					✓	✓	✓	✓	✓	
CO4		✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO5	✓			✓	✓	✓		✓		✓	
Number of Matches(✓) = 36 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – VI**Course code:22UZO6MBE3:1****Exam Hours: 3****Instruction: Hours: 6****Internal Marks: 25****Credit: 5****External Marks: 75**

MAJOR BASED ELECTIVE
BIOINFORMATICS AND BIOSTATISTICS

Objective:

To understand biologically important predictions from annotated data and transformation of these data for DNA analyses

Course Outcomes:

On completion of the course students will be able

- Deals with the primary and secondary databases, collection, storage and retrieval of databases, knowledge of freeware, software and hardware.
- The sequence databases, sequence format, annotation and archival of databases will be understood.
- The choice of alignment, local alignment, global alignment scoring matrices, codon usages analysis, RNA fold analysis, splice site identification will also be studied by the students.
- They will understand types of data, their organisation and various graphical representation methods to represent data, and will enable students to understand the basic statistics and its importance in research.
- Student will be able to calculate various measures of central tendencies, measure of dispersion and measure of kurtosis and skewness and its importance.

BIOINFORMATICS

Unit – I

Introduction :computer – types of modern computers – operating systems – type of operating systems – windows XP windows 2007 –2010 – applications of MS–WORD – MS–EXCEL – MS–PPT – Documentation and Presentation of Bio Statistical data– Browsers – search engines – Use of Internet – Messenger – E–mail – **Basic Knowledge of Medical transcription.**

Unit – II

Biological databases: Definition – Literature databases– NCBI – Pubmed,– Medline – Protein and Nucleic acid Sequence– databases and their relationship – PIR, Swiss – Prot, GeneBank – DDBJ – Structural Databases – PDB – SCOP – CATH – Structural visualization tools, RasMol, – Swiss – PDB viewer.

Unit – III

DNA and RNA sequencing: Pairwise sequence Alignment –Scoring Matrices – PAM – BLOSUM– statistics of alignment scored Dot Plot – local and global alignment – Database searching – FASTA –BLAST –multiple sequence alignment clustal W– Phylogenetic Tress – PHYLIP.

BIOSTATISTICS

Unit – IV

Definition and Scope: Census and sampling methods – collection and presentation of data – Diagrams and graphs; Bar – Pie – Histogram – Line graph – concept of Statistical population and sample characteristics of frequency distribution.

Unit – V

Measures of central tendency: Mean – Median – Mode – Measures of Dispersion – Range, Quartile deviation – Mean deviation – Standard deviation – Test of significance (t– Test).– chi square test

Total topics	Local	Region	National	Global
65	1	0	0	44

Books for Reference:

1. Gupta SP 1996. Statistics –S. Chand and Co., New Delhi.
2. Jerold H. Zar 1984. Bio Statistical analysis [2nd edition] printice Hall of International edition.
3. Goutham Roy 2002. Introduction to Computing and computing lab and Cad Books and allied [pvt]ltd. Kolkata.
4. Christine Solomon. MS. OFFICE for Win – Microsoft office press. Developing Application with MS–OFFICE – Microsoft Office Press.
5. Cynthia Gibbs. Developing Bioinformatics Computer Skills. Sheoff Publishers and Distributors Pvt.Ltd, Mumbai.
6. Arthur. M. Lesk 2003. Introduction to Bioinformatics, Oxford University Press, New Delhi.
7. Arthur. M. Lesk, Introdtion to protein Structures Oxford University Press, New Delhi, 2000
8. Baxevanis, A and Outllette 2005. Bioinformatics a practical guide to the analysis of genes and proteins, Willy – Intersience, Hoboken, NJ. USA.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course	Hours	Credits
VI	22UZO6MBE3:1	Bioinformatics and biostatics	6	5
Course	Programme Outcomes(POs)		Programme Specific Outcomes(PSOs)	

Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
C01	✓		✓	✓		✓	✓	✓	✓	✓
C02		✓		✓		✓	✓		✓	✓
C03			✓		✓		✓		✓	
C04	✓	✓	✓	✓	✓	✓	✓		✓	✓
C05		✓	✓		✓	✓	✓	✓	✓	✓
Number of Matches(✓) = 35 Relationship: High										

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – VI

Course code:22UZO6MBE3:3

Exam Hours: 3

Instruction: Hours: 6

Internal Marks: 25

Credit: 5

External Marks: 75

MAJOR BASED ELECTIVE
PUBLIC HEALTH AND HYGIENE

Objective:

Human resources in the science of public health, with a firm understanding of the determinants of health and the public health system in the country.

Course outcomes:

- This course will provide the knowledge and skills necessary to assess their impact on public health and sustainability.
- The health/disease distinction is irrelevant for most decisions and represents a conceptual straight jacket.
- The cause of environmental pollution and design appropriate control measures to improve the health outcomes
- Sophisticated and mature clinical decision making requires that we free ourselves from the disease.
- Develop an arbitrary plan of action to improve the waste disposal methods.

Unit I

Determinants of health – Health indicators; Personal hygiene; Public health; health – Dynamics of disease transmission – host, agents, environment.

Unit II

Concepts of Health and Disease – Nutrition and Health: Classification of foods – Nutritional deficiencies – Vitamin and Mineral deficiencies – Balanced diet – Nutritional requirements of special groups.

Unit III

Environment and Health: Types of Pollution – Air Pollution, Water Pollution, Soil Pollution, Noise Pollution, Land pollution. – Radiation – effects; Solid waste and excreta disposal – Impact of pollutants on Health – Mental health and hygiene.

Unit IV

Communicable Diseases: Measles, Cholera, Amoebiasis, Malaria, Filariasis, Japanese encephalitis, Swine flu, STD and AIDS. – Non Communicable Diseases: Coronary Heart Disease. Hypertension, Diabetes, Obesity, Stroke, Cancer.

Unit V

Health care services in India – Health planning in India – Health Programmes in India, –WHO – Non-Governmental Voluntary Health organizations – First Aid and Nursing methods –Dressing, Care, Duties, Preparations

Total topics	Local	Region	National	Global
26	0	4	4	18

Text books:

1. Park and Park. Text book of Preventive and Social Medicine. M/s. BanarsidasBhanot Publishers, Jabalpur, 1995

U.G. Dept. of Zoology, Thanthai Hans Roever College (Autonomous), Perambalur – 621 220.(Syllabus 2022– 2023 onwards)

Books for Reference:

1. Verma, S. Medical Zoology, Rastogi Publications, New Delhi, 1998

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
VI	22UZO6MBE3:3	Public Health and Hygiene					6	5			
Course Outcomes (COs)	Programme Outcomes(POs)					Programme Specific Outcomes(PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓		✓	✓		✓	✓	✓	✓	✓	
CO2	✓	✓		✓		✓	✓		✓	✓	
CO3			✓		✓		✓		✓		
CO4	✓	✓	✓	✓	✓	✓	✓		✓	✓	
CO5		✓	✓		✓	✓	✓	✓	✓	✓	
Number of Matches(✓) = 36 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER-I

Coursecode:22UZ01AC1

Instruction:Hours:3

Credit:3

ExamHours:3

InternalMarks:25

ExternalMarks:75

ALLIED COURSE- I BIOLOGY OF INVERTEBRATES AND CHORDATES

Course Outcomes:

On completion of the course students will be able.

- The learner to understand the diversity and basic taxonomy of Non-chordates.
- The learner will get an idea of adaptation and importance of non-chordates.
- The learner to identify the animal at basic level.
- The learner to identify any vertebrate animal at basic level.
- 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.

Unit I

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

Unit II

Detailed study of Paramoecium – Obelia – Fasciola hepatica – Earthworm.

Unit III

Detailed study of Prawn – Lamellidens

Unit IV

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

Unit V

Detailed study of external features, digestive system, respiratory system, circulatory system, urogenital system and brain of Pigeon

Books for references

1. Outlines of Zoology – M. Erambaranatha 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.

Total topics	Local	Region	National	Global
15	5	4	3	10

Coursecode:22UZO2AC2

Instruction:Hours:5

Credit:4

ExamHours:3

InternalMarks:25

ExternalMarks: 75

ALLIEDCOURSEII–ECONOMICZOOLOGY

CourseOutcomes:

On completion of the course students will be able.

- Understand the significance of apiculture for the uplift of rural economy
- Create self-employment opportunities to rural students through animal husbandry, aquaculture, Vermiculture and Sericulture
- Know how to isolate pharmaceutical products from animal sources

UNIT I

Vermiculture: Classification of earthworm; Species of Earthworms – Life cycle of *Lampitoma mauritii* – Preparation of vermin bed – Vermiwash – Vermicomposting – Economic importance – Earthworms in medicine – bio waste management

UNIT II

Apiculture: Classification of honey bee – Species of Honey Bees: colonial structure of honey bee – Biology of Honey bee – Types of bee hives – Extraction of honey – Nutritive and medicinal value of honey.

Lac culture: Classification of lac insect – species of lac insect – host plant – Types; Life cycle of Lac insect – Extraction of Lac: Processing; purification – Economic importance of Lac – Uses of Lac: Medicinal, Industrial, Ornamental.

UNIT III

Sericulture: Classification – Species; Life cycle of *Bombyx mori* – Rearing of silk worm – Paraffin paper rearing – Box rearing – New net method – Co-operative methods – Morigulture – types of mulberry plants – planting methods – Diseases of silk worm: Protozoan – Bacterial – Viral diseases (each two) – Reeling of silk – Economic importance of sericulture.

UNIT IV

Aquaculture: Freshwater fishes (Indian major carps) – Site selection and construction of pond – Fish feed – Induced breeding – Fish diseases – rearing methods – Furunculosis – Epizootic Ulcerative Syndrome (EUS) – Vibriosis – Fresh water Prawn culture

UNIT V

Poultry farming: Types of fowls – Rearing methods of Broilers and Layers –Poultry nutrition – Poultry diseases (NCD, IBV & Fowls) – Issues and limitations of poultry farming – **Dairy farming:** Breeds of Dairy animals (Cow, Buffalo and Goat) and their characteristics.

Total topics	Local	Region	National	Global
54	43	7	1	1

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	20UZO5SBE2:1	Applied Zoology					2	2			
Course		Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
Outcomes(COs)		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1			✓		✓			✓	✓	✓	✓
CO2		✓	✓	✓		✓		✓	✓	✓	✓
CO3		✓	✓	✓		✓	✓	✓	✓	✓	✓
CO4		✓	✓		✓			✓	✓	✓	✓
CO5			✓	✓		✓	✓	✓	✓	✓	✓
Number of Matches(✓)=36Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER-II

ALLIED PRACTICAL- BIOLOGY OF INVERTEBRATES AND CHORDATES

- **Dissection**

Earthworm: Nervous system

Cockroach: Digestive system – Nervous system

- **Mounting:**

Earth worm: Body – Penial

seate Cockroach – honey bee:

mouth parts Shark: Placoid scale

- **SPOTTERS:**

- 1. Classify by giving reasons**

Paramecium– Entamoeba– Trypanosoma– Plasmodium– Ascaris– Fasciola– Wuchereria Bancrofti– Sycon– Obelia– Taenia solium– Leech– Nereis– Prawn– Freshwater mussel– Limulus– Nauplius– Mysis– Zoa– Seastar– Balanoglossus– Amphioxus– Ascidian– Shark– Calotes– sea snake– Pigeon– Bat– Rat.

- 2. Biological significance:**

Paramecium conjugation– Physalia– Trochophore Larva– Peripatus– Sea Anemone on Hermit Crab– Pearl Oyster– Bipinnaria Larva– Anabas– Cobra– Russell's Viper.

- 3. Relate structure and function:**

Sponge Spicules– Obelia– Polyp– Taenia– Scolex– Nereis – Parapodium– Honey bee sting apparatus– Pedicellaria of Sea star– Ctenoid Scale– Quill Feather of Pigeon.

- 4. Draw labeled sketches:**

Pectoral girdles of Frog – Pigeon. Pelvic Girdles of Frog – Pigeon. Fore – Hind limbs of Frog.

- **Books for Reference:**

1. Verma, P.S. 2011 A Manual of Practical Zoology INVERTEBRATES Chand & Co, Ltd, Ram Nagar– New Delhi.
2. Verma, P.S. 2011 A Manual of Practical Zoology CHORDATES, Chand & Co, Ltd. Ram Nagar– New Delhi.
3. Jayanpa Sinha. 2010 Advanced Practical Zoology, Books & Allied (p) Ltd. No. 1. Subham Plaza I Floor, Calcutta.

Total topics	Local	Region	National	Global
9	5	1	1	2