

**B.Sc. ZOOLOGY  
SYLLABUS**

S.No	SEM	SUB.CODE	PAPER	HOURS/ WEEK	CREDIT	EXAM HOURS	MARKS		
							INTERNAL	EXTERNAL	TOTAL
1	I	21ULT1	LC-I- Language	6	3	3	25	75	100
2	I	21ULE1	ELC-I- English	6	3	3	25	75	100
3	I	21UZO1	CC-I- Invertebrata	5	5	3	25	75	100
	I	21USBE1	SBE-1- Common paper	2*	-	-	-	-	-
4	I	21UES	EVS – Environmental Studies	2	2	3	25	75	100
5	II	21ULT2	LC- II - Language	6	3	3	25	75	100
6	II	21ULE2	ELC-II - English	6	3	3	25	75	100
7	II	21UZO3	CP-1 – Practical covering CC-I & CC-II)	3	4	3	40	60	100
8	II	21UZO2	CC-III-Chordata	6	5	3	25	75	100
9	II	21UBTA1	AC-I – Allied Botany	2	5	3	25	75	100
10	II	21UBTA2P	AP-I – Allied Botany Practicals	3	5	3	40	60	100
11	II	21UVE	VE – Value Education	2	2	3	25	75	100
12	II	21USBE1	SBE-I – Common Paper	2	4	3	25	75	100
13	III	21ULT3	LC-III - Language	6	3	3	25	75	100
14	III	21ULE3	ELC-III- English	6	3	3	25	75	100
15	III	21UZO4	CC-IV – Cell Biology	5	5	3	25	75	100
	III	21USBE2	SBE-II – Common Paper	2	4	-	-	-	-
16	III	21UZON1	NME-I – Poultry Science/ Economic zoology( For Physical education students)	4	2	3	25	75	100
17	IV	21ULT4	LC-IV - Language	6	3	3	25	75	100
18	IV	21ULE4	ELC-IV - English	6	3	3	25	75	100
19	IV	21UZO5	CC-V - Ecology	5	4	3	25	75	100
20	IV	21UZO6	CP- 2 – Practical II (Practical covering CC-III & CC-IV)	3	4	3	40	60	100
21	IV	21UCHA3	AC-III - Allied Chemistry	3	5	3	25	75	100
22	IV	21UCHA4P	AP-IV- Allied Chemistry Practical	3	5	3	40	60	100
23	IV	21USBE2	SBE-II - Common Paper	2	4	3	25	75	100
24	V	21UZO7	CC-VII – Bio physics, Bio Chemistry & Bio Statistics	4	4	3	25	75	100
25	V	21UZO8	CC-VIII – Developmental Biology	4	4	3	25	75	100
26	V	21UZO9	CC-IX- Genetics	5	4	3	25	75	100
27	V	21UZOE1A/ 21UZOE1B/ 21UZOE1C	EC-I – Biotechnology/ Bio instrumentations/ Animal behaviour	5	5	3	25	75	100
28	V	21UZON2	NME-II – Public Health & Hygiene/ Apiculture and Sericulture (For Botany Students)	2	2	3	25	75	100
29	V	21USBE3	SBE-III – Common Paper	4	2	3	25	75	100
30	VI	21UZO10	CC-X – Animal Physiology	5	5	3	25	75	100
31	VI	21UZO11	CC-XI – Evolution	5	5	3	25	75	100
32	VI	21UZO12	CC-XII – Immunology	4	4	3	25	75	100
33	VI	21UZO13	CP-3 – Practical – III ( Covering Paper – CC V, VI & VII)	3	4	3	40	60	100
34	VI	21UZO14	CP- 4 Practical - IV (Covering Paper – CC VIII, IX & X)	3	4	3	40	60	100
35	VI	21UZOE2A/ 21UZOE2B/ 21UZOE2C	EC-II- Microbiology/ Molecular Biology / Communicable Diseases	5	5	3	25	75	100
36	VI	21UZOE3A 21UZOE3B 21UZOE3C	EC-III - Vermiculture/ Ornamental Fish Culture/ Biodiversity conservation	4	4	3	25	75	100
37	VI	21UGS	GS – Gender Studies	1	1	3	25	75	100
			Value added course 1 &11						
				<b>177</b>	<b>140</b>				<b>3700</b>

Value added course

- 1) Aquarium Fish Keeping (21UZOV1)
- 2) Medical lab technology (21UZOV2)

## **B.Sc. ZOOLOGY**

### **PROGRAMME OBJECTIVE:**

- The courses are framed in such a way that the students entering this college for higher education in Zoology will be provided strong and thorough knowledge in the subject and will be taught from basic fundamentals in the subject to mastering level ( mastering themselves with the knowledge of recent advancements in the field). The success in this fine tuning was achieved by the way of framing of courses with gradual up-liftment in the ensuing semesters.
- This programme is designed in such a way that on completion of programme the students will possess sound knowledge with good foundation, practical skills, communication skills, entrepreneur skills and become self sustained. It also paves way for the students to continue their higher education and pursue research in their field of interest.
- The programme aims to provide students with the opportunity to study animal life in all its diversity, at scales that range from the subcellular to that of the ecosystem, and to provide them with a suitable foundation for careers in for example research, teaching, the biological control of pests or the conservation of endangered species in the wild.
- It emphasises a mix of modern molecular laboratory expertise, practical field skills and traditional taxonomy. This programme deepens this understanding of zoological concepts and develops a range of expertise over the main areas of the subject.
- During the course of their studies, all students will be expected to enhance their academic and personal transferable skills. Students will also gain experience in the methodology of research and scholarship.

## PROGRAMME SPECIFIC OUTCOMES: (PSO)

PSO1: The students will develop their ability to understand the basic concepts of zoology viz., animal kingdom, systematic classification, anatomy, morphology, physiology, embryology, evolution, ecology etc.

PSO2: The students will have ability to identify, classify and describe various organisms from different phylum by understanding their structure and function of various organ system and relationship with their environment

PSO3: The students will develop ability to explain structure and functions of a cell and organ (from molecular level to the organ system level) as well as the process of development of an embryo

PSO4: The students will able to work independently to enhance their expertise through various activities like seminars, assignments, etc., and they can manage a project like Vermiculture, Apiculture, Aquaculture etc., on completion of the course.

PSO5: The students will have the knowledge to minimize the environmental issues like global warming, pollution, degradation of natural resources, and helps in conservation endangered species, afforestation etc.

### Programme Outcomes

PO Number	PO statement
PO1	To impart basic knowledge of various branches of Zoology and to understand the unity of life with the rich diversity of organisms and their ecological and evolutionary significance.
PO2	To acquire basic skills in the observation and study of nature, biological techniques, experimental skills and scientific investigation.
PO3	To address the socio-economical challenges related to animal sciences and to facilitate students for taking up and shaping a successful career in Zoology and its related subjects.
PO4	To inculcate transformational impact on the quality of education and to inspire the students to adopt scientific temper and live with scientific values.
PO5	To make the students aware of applications of Zoology and to highlight the potential of various branches to become an entrepreneur.
PO6	To assess the scope of animal biology and select particular areas for further study.
PO7	Understand good laboratory practices as per laboratory standards, handling the sophisticated instruments/equipment to develop technical skills, research oriented skills about research methodologies, effective communication and skills of problem solving methods

**I**  
**SEMESTER**

SEMESTER - I - CC I  
21UZ01

HOURS/ WEEK – 5  
CREDIT- 5

## INVERTEBRATA

### Objectives:

To study the functional aspects of different systems and their significance of invertebrates in a comparative basis.

### UNIT- I - PROTOZOA:

General characters and classification upto order with examples.

**Detailed study:** Paramecium

**General topics:** Protozoan Parasite: - *Plasmodium vivax* -life history Host Parasitic interactions in *Entamoeba histolytica* and *plasmodium vivax* - Locomotion in Protozoa.

### UNIT-II - PORIFERA AND COELENTERATA:

General characters and classification upto order with examples.

**Detailed study:** *Hydra vulgaris*

**General topics:** Canal system in sponges – Polymorphism and economic importance of coral reefs.

### UNIT- III - PLATYHELMINTHES AND ASCHELMINTHES:

General characters and classification up to order with examples.

**Detailed study:**, *Taenia solium*

**General topic; Nematode** parasites in man – Host parasitic interactions of Helminthes parasites – *Ascaris lumbricoides*

### UNIT- IV- ANNELIDA AND ARTHROPODA:

General characters and classification up to order with examples

**Detailed study:** *Nereis pelagica*

**General topic:** Adaptive Radiation in annelid, Respiratory organs in Arthropod, Asexual Reproduction in polychaeta.

Connecting link between Annelida - Arthropoda

### UNIT-V- MOLLUSCA AND ECHINODERMATA:

General character and classification up to order with examples.

**Detailed study:** *Asterias rubens* (star fish)

**General topics:** Larval forms of Echinoderms – Autotomy and Regeneration, Water vascular System. Economic importance of molluscs.

### Course Outcomes

CO Number	CO Statement
CO1.	Describe the distinguishing characteristics of the major taxa Explain the basic aspects of classification details of invertebrates Understand biodiversity, habitat, adaptation organization and taxonomic status of invertebrates
CO2.	Recall certain morphological attributes and physiological processes that are distinct and significant to each Phyla
CO3.	Understand the systemic and functional morphology of various groups of invertebrates Explain the basic aspects of structural and functional details of Invertebrates
CO4.	To compare and understand the general and specific characteristics within each Phyla
CO5.	Adaptation of the major taxa and to explain their economic importance with respect to Non-Chordates

### Mapping course outcomes with Programme outcomes

PO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	9	3	3	1	9	3
CO2	9	3	9	9	9	3	9
CO3	3	9	9	3	9	3	1
CO4	9	9	3	9	9	3	3
CO5	3	9	3	3	1	9	3
Weightage	27	39	27	27	29	27	19
weighted percentage of course contribution of pos	3.5	5.3	4.3	4.2	5.2	4.1	3.2

Level of correlation between co's and po's

1-Low 3 – Medium 9- High 0 - No correlation

**TEXT BOOK**

1. Ayyar, C.K and T.N Ananthkrishnan 1992. A manual of Zoology Vol-I (Invertebrata).
2. Kotpal, R.L. and S.K., Agarwal.1989. Modern text book of Zoology. Rostogi Publications.
3. Jordan.E.L and Verma.P.S, Invertebrate Zoology Revised Edn., S.Chand and Co. Ltd. RamNagar, New Delhi, 2014.
- 4.N. C. Nair, N. Soundara Pandian, S. Leelavathy, T. Murugan, A Text Book of Invertebrates, Saras Publications, 2013.

**REFERENCES:**

1. Barrington, .J.W.1998. Invertebrates. Structure and function. MLBS publications
2. Hyman, I.H., 1986.The Invertebrates.Vol.I to VIII Mc Graw Hill publications Co.
3. Jordon, E.L., and P.S.Verma 1995. Invertebrate Zoology 12<sup>th</sup> edn. S.Chand & Co.



**SEMESTER - I**  
**21USBE1**

**HOURS/ WEEK – 2**  
**CREDIT- 4**

## **SOFT SKILLS AND INDUSTRY AWARENESS - PAPER I**

### **Learning Objectives:**

- i) To inculcate positive attitude among the learners
- ii) To introduce goal setting to the learners
- iii) To instill effective communicative skills in the learners
- iv) To expose the learners to the basics of computers
- v) To initiate the learners into computer applications

### **UNIT - I**

#### **POSITIVE ATTITUDE :**

Attitude - features of attitudes - formation of attitudes - psychological factors - change of attitudes – ways of changing attitude in a person – the power of positive attitude - the benefits of positive attitude - developing positive attitude - obstacles in developing positive attitude - negative attitude - the causes of negative attitude - the consequences of negative attitude -how to change negative attitude.

### **UNIT - II**

#### **GOAL SETTING**

Introduction –importance of goal setting - goal definition - types of goals -what exactly goal setting - why people don't set goals - how to choose the right goals.

**SMART GOALS** - Career goals -benefits of career goal setting - goal setting tips.

### **UNIT- III**

**COMMUNICATION SKILLS** - Communication process –types of communication - barriers to effective communication --- listening skills --- importance of tone of voice - voice clarity ---verbal expressiveness –tips to develop communication skills ---government initiatives – job roles

### **UNIT - IV**

**KNOWING COMPUTER** - characteristics of a computer – limitations of a computer – components of hardware -basics of operating systems - definition – functions of operating systems – categories of operating systems - windows features - start up, shut down - opening and closing an application - manipulating windows --- saving – printing – deleting files –start menu

## UNIT - V

**COMPUTER APPLICATIONS:** Word Processing : launching word, word processing basics, the quick access toolbar, opening a document, saving a document, formatting the text, table manipulation

Using Spread Sheet : elements of electronics spreadsheet, manipulation of cells, formula and function- functions

### Learning outcomes:

Learners

- i) know to develop positive attitude
- ii) Know how to set goals
- iii) Learners develop effective communicative skills
- iv) Learners know the basics of computers
- v) Learners know various computer applications

### PRESCRIBED BOOK:

1.Soft Skills and Industry Awareness - ICT Academy of Tamil Nadu

### BOOKS FOR REFERENCE :

- 1.Dr.Alex – Soft Skills, S.Chand, New Delhi
- 2.Raveendiran *et al.* Success Through Soft Skills

**SEMESTER - I**  
**21UES**

**HOURS/ WEEK - 2**  
**CREDIT - 2**

**ENVIRONMENTAL STUDIES**

**OBJECTIVES:**

1. To create awareness among students about the importance of environment in which they live.
2. To make the students to know about the significance and the importance of biodiversity.
3. To make the students to realise their social responsibility and protect the nature.

**UNIT – I**

**Definition and Nature of Environmental Studies :** Definition – Nature and scope – Importance of Environmental Studies – Need for Public Awareness Renewable and Non-renewable resources – Natural Resources and Associated Problems.

**UNIT – II**

**Ecosystem:** Concept of Ecosystem – Structure and Function of an Ecosystem – Producers, Consumers and Decomposers – Energy flow in the Ecosystem- Ecological Succession – Food Chains- Food Web - Ecological Pyramid.

**UNIT –III**

**Biodiversity and its Conservation:** Definition: Genetic, Species and Ecosystem Diversity – Biogeographical Classification of India – Value of Biodiversity: consumptive use, productive use, Social, ethical aesthetic and option values – Biodiversity at Global, National and Local levels – India as a Mega- Diversity Nation – Hot-spots of Biodiversity – Threats to Biodiversity : habitat loss, poaching of wildlife, man wildlife conflicts – Endangered and endemic species of India – Conservation of Biodiversity : In-situ and Ex-situ conservation of Biodiversity.

**UNIT – IV**

**Environmental Pollution:** Definition – Causes, Effects and Control measure of Air pollution – water pollution – Soil pollution- Marine pollution – Noise pollution- thermal pollution- Nuclear pollution – Solid Waste Management- Causes – Effects and Control measure of urban and Industrial wastes – role of individual prevention of pollution.

## UNIT- V

**Social issues and Human population in relation to Environment:** Urban problems and related to Energy – Climate change – global warming – Acid rain- ocean layer depletion – population growth, variation among nations- population explosion- Family welfare programmes – Environment and human Health- Human rights – value education – HIV/AIDS –Women and Child welfare- Role of Information technology in Environment and Human Health.

### REFERENCES:

1. Environmental Economics - S.Sankaran
2. Environmental Economics - M.Karpagam
3. Environmental Economics - S.Varatharajan
4. Environmental Economics - D.W.Pearce
5. Environmental Studies - Dr.C.Sethuraman – NCBH (P) Ltd- Chennai

**II**  
**SEMESTER**

**SEMESTER – II - CC-III  
21UZO3**

**HOURS/ WEEK – 6  
CREDIT - 5**

## **CHORDATA**

### **OBJECTIVES:**

To study the functional aspects of different systems and their significance of vertebrates in a comparative basis. To understand basic classification, structural and functional details of chordates and to interpret the evolutionary relationships among the major taxa

### **UNIT-I**

General characters and outline classification of chordates – Amphioxus – Retrogressive metamorphosis of Ascidia-Feeding mechanism of Balanoglossus.

### **UNIT-II**

General characters of Pisces and its classification – Detailed study of Shark – (Excluding Endoskeleton). Parental care in fishes – Migration of fishes.

### **UNIT-III**

General characters and its classification of Amphibia and Reptilia – Origin of reptiles. (Excluding Endoskeleton) – Detailed study: – Calotes -Parental care of Amphibia- Identification of poisonous and non poisonous snakes in India.

### **UNIT-IV**

General characters and classification of Aves – Detailed study of pigeon (Excluding Endoskeleton) - Migration in birds – Flightless birds - Characters and their distribution.

### **UNIT-V**

General characters and classification of mammals –Detailed study of Rabbit (Excluding Endoskeleton) - Placenta in mammals - Dentition in mammals – Aquatic mammals.

### Course Outcomes

CO Number	CO Statement
CO1	Identify the general and specific characteristics of the different classes and the organization of the representative types.
CO2	Recognize and describe the major groups of chordates
CO3	Understand the diversity of Chordates and its outline systematic. Discuss their affinities and adaptations to different modes of life.
CO4	Understand the unique features, taxonomy and functional morphology of different classes of chordates
CO5	Comparative anatomy of major taxa and to explain their economic importance with respect to Chordates.

### Mapping course outcomes with Programme outcomes

PO \ CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	9	9	3	3	9	3
CO2	3	3	3	9	3	3	3
CO3	9	3	3	3	3	3	9
CO4	3	3	9	3	3	3	9
CO5	9	9	3	9	9	9	3
Weightage	33	27	27	27	21	27	27
weighted percentage of course contribution of pos	4.3	3.7	4.3	4.2	3.7	4.1	4.5

Level of correlation between co's and po's

1-Low    3 – Medium    9- High    0 - No correlation

**TEXT BOOKS:**

1. M.Ekambaranatha Ayyar (1993) – Out lines of Zoology - Vol- I. S.Viswanathan. Pvt. Ltd, Chennai.
2. Jordon, E.L. and Verma P.S (2003) – Invertebrate Zoology. S. Chand & Co.

**REFERENCES:**

1. Kotpal, R.L. and S.K., Agarwal.1989. Modern text book of Zoology. Rostogi Publications.
2. H.D.Kumar (2000) – Biodiversity- Principles and conservation, Agrobios (India).
3. Gagdil M. (1996) – Biodiversity. Vol – 2. Indian academy of science, Bangalore.12.



SEMESTER – II – AC-I

HOURS/ WEEK – 2  
CREDIT - 5

## ALLIED ZOOLOGY

### ANIMAL DIVERSITY AND ECONOMIC ZOOLOGY

#### OBJECTIVES:

Animal diversity which is an essential topic for biologists to know the distribution, taxonomy and phylogeny of animal. To enlighten the primitive forms of invertebrates and vertebrates distribution. To help our students to understand the status and mode of living of different forms of animals. To give awareness to our students in various cultural aspects of zoology which will help them to design their future.

#### UNIT-I

**INVERTEBRATA:** Outline Classification & General characters of Protozoa and Colenterata

**Type study** : *Hydra vulgaris*

**General topics** : Parasitic Protozoans – *Plasmodium vivax*, *Trypanosoma gambiense*

#### UNIT-II

General characters of Aschelminthes and Annelida

**Type study** : *Ascaris lumbricoides*

**General topics** : Parasitic adaptation in *Wuchereria bancrafti*, leech (Hirudinia)

#### UNIT-III

General characters of Arthropoda and Echinodermata

**Type study** : Cockroach – (*Periplaneta americana*)

**General topics** : Larval forms of Echinodermata  
Crustacean parasites

#### UNIT-IV

**Vertebrata** : Outline Classification and general characters of reptiles, birds and mammals

**Type study** : Rabbit (*Oryctolagus cuniculus*)

**General topics** : Aquatic mammals - Identification of poisonous and non poisonous snakes.

#### UNIT-V - Economic Zoology

**Apiculture** : Species of honey bees and Honey extraction)

**Aquaculture** : Indian major carps and Ornamental fish culture (gold fish, black molly and guppies, angel fish, tiger fish).

**Sericulture** : Mulberry and non mulberry silk worms of India, Uses of silk & by products of silk industry.

**Vermiculture** : Vermicomposting- preparation of vermibed- nutrient aspect of vermicompost.

**Course Outcomes:**

CO Number	CO Statement
CO1	Familiar with General characters of Protozoa And Coelenterata
CO2	Familiar with General characters of Aschelminthes and Annelida
CO3	Familiar with General characters of Arthropoda and Echinodermata
CO4	Familiar with Outline Classification and general characters of reptiles, birds and mammals
CO5	Familiar with Apiculture ,Aquaculture Sericulture and Vermiculture

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	9	9	3	1	9	3
CO2	3	3	3	9	9	9	3
CO3	3	3	1	3	3	3	9
CO4	9	3	3	3	3	3	3
CO5	3	9	3	3	1	3	9
<b>Weightage</b>	<b>27</b>	<b>27</b>	<b>19</b>	<b>21</b>	<b>17</b>	<b>27</b>	<b>27</b>
<b>weighted percentage of course contribution of pos</b>	<b>3.5</b>	<b>3.7</b>	<b>3.0</b>	<b>3.2</b>	<b>3.0</b>	<b>4.1</b>	<b>4.5</b>

Level of correlation between co's and po's

1-Low 3 – Medium 9- High 0 - No correlation

**TEXT BOOKS:**

1. Ganga and Sulochana chetty 2010 – An Introduction to Sericulture .Oxford and IBH publishing Co

**REFERENCES:**

1. Ayyar, C.K. and T.N. Ananthakrishnan 1992. A manual of zoology Vol- I (Invertebrata)
2. Jorden, .L. and P.S. Verma.1995. Chordate Zoology and Elements of animal physiology. S.Chand & Co.
3. David B.V and T.J Kumaraswami. 1998. Elements of Economic entomology. Popular Book Depot.

**SEMESTER – II – AP-I**

**HOURS/ WEEK – 3  
CREDIT- 5**

**ALLIED ZOOLOGY PRACTICAL**

**INVERTEBRATA:**

**VIRTUAL DISSECTION**

**Frog** : Digestive System & Nervous Systems

**Prawn** : Digestive System & Nervous Systems

**DISSECTION**

**Cockroach** - Digestive System & Nervous Systems

**MOUNTING**

**Cockroach** : Mouth parts

**Prawn** : Appendages

**SPOTTERS AND SLIDES**

**Protozoa**

- Paramecium Entire and Paramecium conjugation
- Trypanosoma and Entamoeba

**Porifera**

- Sycon, Gemmule and Spicules

**Coelenterate**

- Hydra, Physalia, Obelia medusa and Sea anemone

**Platyhelminthes**

- Liverfluke, Ascaris (Male & Female ) Tapeworm Entire, Scolex, proglottids and Redia Larva

**Annelida:**

- Nereis Entire, Parapodium, Heteronereis, Trochophore larva, Chaetopterus and Leech

**Arthropoda**

- Penaeus , Peripatus, Limulus, Hermit Crab and Sea anemone

**Mollusca**

- Unio, Chiton and Sepia
-

**Echinodermata**

- Starfish, Bipinnaria Larva and Sea Urchin

**CHORDATA:**

**Prochordata:**

- Amphioxus and Ascidian

**Fishes**

- Shark, Echinus, Exocoetus and Hippocampus

**Amphibia**

- Bufo, Hyla, and Ichthyophis

**Reptilia**

- Naja Naja, Viper, Draco and Chamaeleon

**Aves**

- Pigeon, Different types of Feathers

**Mammalia**

- Rabbit and Bat

**Dentition**

- Rabbit and Man

**Course Outcomes:**

CO Number	CO Statement
CO1	Evaluate General characters of the Nervous Systems & Digestive System of Cockroach
CO2	Evaluate General characters of the Nervous Systems & Digestive System of prawn
CO3	Familiar with the mounting of Mouth parts of Cockroach
CO4	Familiar with the mounting of Appendages of Prawn
CO5	Evaluate General characters of the representative animals of invertebrate and chordate phylums

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	3	9	9	9	9	9
CO2	3	9	3	9	9	3	3
CO3	3	9	9	9	3	9	9
CO4	9	9	9	3	9	9	9
CO5	3	3	9	9	3	9	3
Weightage	27	33	39	39	33	39	33
weighted percentage of course contribution of pos	3.5	4.5	6.3	6.1	5.9	6.0	6.6

**Level of correlation between co's and po's**

**1-Low    3 – Medium    9- High    0 - No correlation**

**TEXT BOOKS:**

1. P.S.Verma: Advanced Practical in Zoology (S.Chand & Co).
2. K.Vijaraman and K.Palanivel: Cheymurai vilangial (Tamil book) : A complete Book (Chimeera)

**SEMESTER - II**  
**21UVE**

**HOURS/ WEEK – 2**  
**CREDIT - 2**

**VALUE EDUCATION**  
**[ALL UG COURESES]**

**Sub Code: 18UVE**

**OBJECTIVES:**

1. To familiarize the students with value concepts.
2. To make the students aware of different types of values.

**UNIT – I: CONCEPT OF VALUES**

Meaning of Value Education – Need and purpose of Value Education – Significance of Value Education in present context – Types of Values through various genres of literature.

**UNIT - II: FAMILY VALUES**

Components, Structure and Responsibilities of Family – Neutralization of anger – Adjustability – Threats of family life – Status of women in family and society – Caring for needy and elderly – Time allotment for sharing ideas and concerns.

**UNIT – III: ETHICAL VALUES**

Professional Ethics – Mass Media Ethics – Advertising Ethics – Influence of Ethics on Family Life – Psychology of Children and Youth – Leadership qualities – Personality Development.

**UNIT – IV: SOCIAL VALUES**

Faith, Service and Secularism – Social sense and Commitment – Students and politics – Social Awareness, Consumer Awareness, Consumer Rights and responsibilities – Redressal Mechanisms.

**UNIT – V: SPIRITUAL VALUES**

What is Religion? – Role of Religion – Misinterpretation of Religion Relationship between Spiritual and religion – Moral Policing – Consequences – Religion sa Spritual Quest – Aesthetics and Religion.

**Reference Books:**

- 1.T. Anchukandam and J. Kuttainimathathil (Ed) Grow Free Live Free, Krisitu Jyoti Publications, Bangalore (1995).
- 2.Mani Jacob (Ed) Resource Book for Value Education, Institute for Value Education, New Delhi 2002 DBNI, NCERT, SCERT, Dharma Bharti National Institute of Peace and Value Education, Secunderabad, 2002.
- 3.Daniel and selvamony – Value Education Today, ( Madras Christian College, Tambaram and ALACHE, New Delhi, 1990)
- 4.S. Ignacimuthu – Value for life – Better Yourself Books, Mumbai, 1991.
- 5.M.M.M. Mascaronhas centre for Research Education Science and Training for Family Life Promotion – Family Life Education, Bangalore, 1993.
- 6.Dr. C. Sethuraman – NCBH (p) Ltd. Value education – Chennai.

**WEBSITES AND e-LEARNING SOURCES**

[www.rkmissiondhe/.org/education.html/](http://www.rkmissiondhe/.org/education.html/)

[www.clallam.;;org/lifestyle/education .html/](http://www.clallam.;;org/lifestyle/education .html/)

[www.sun.com/./edu/progrmws/star.html/](http://www.sun.com/./edu/progrmws/star.html/)

[www.infoscouts.com](http://www.infoscouts.com)

[www.secretofsuccess.com](http://www.secretofsuccess.com)

[www.1millionpapers.com](http://www.1millionpapers.com)

[://militaryfinance.umuc.edu/education/edu-network.html/](http://militaryfinance.umuc.edu/education/edu-network.html/)



**SEMESTER – I &II**  
**21UZO2**

**HOURS/ WEEK – 3**  
**CREDIT- 4**

**INVERTEBRATA & CHORDATA**

**MAJOR PRACTICAL -1**

**INVERTEBRATA:**

**VIRTUAL DISSECTION:**

**Frog** : Digestive & Nervous System  
**Prawn** : Digestive & Nervous System

**DISSECTION**

**Cockroach** - Digestive & Nervous System

**MOUNTING**

**Prawn** : Appendages of prawn  
**Cockroach** : Mouth parts, salivary glands

**SPOTTERS AND SLIDES**

**Protozoa**

- Paramecium Entire and conjugation
- Trypanosoma and Entamoeba

**Porifera**

- Sycon, Gemmule and Spicules

**Coelenterata**

- Hydra, Physalia, Obelia medusa and Sea anemone

**Platyhelminthes**

- Liverfluke, Ascaris (Male & Female ) Tapeworm Entire, Scolex proglottids, and Redia Larva

**Annelida**

- Nereis Entire, Parapodium, Hetero-nereis, Trochophore larva, Chaetopterus and Leech

**Arthropoda**

- Penaeus , Peripatus, Limulus and Hermit Crab

**Mollusca**

- Pila, Unio, Chiton and Sepia

**Echinodermata**

- Starfish, Bipinnaria Larva and Sea Urchin

**CHORDATA:**

**Prochordata:**

- Amphioxus and Ascidian

**Fishes**

- Shark ,Echinus, Exocoetus and Hippocampus

**Amphibia**

- Bufo, Hyla and Ichthyophis

**Reptilia**

- Naja Naja, Viper, Draco and Chamaeleon

**Aves**

- Pigeon, Types of Feathers

**Mammalia**

- Rabbit and Bat

**Dentition**

- Rabbit and Human

**Course Outcomes:**

CO Number	CO Statement
CO1	Evaluate General characters of the Nervous Systems & Digestive System of Cockroach
CO2	Evaluate General characters of the Nervous Systems & Digestive System of prawn
CO3	Familiar with the mounting of Mouth parts and salivary glands of Cockroach
CO4	Familiar with the mounting of Appendages of Prawn
CO5	Evaluate General characters of the representative animals of invertebrate and chordate phylums

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	3	9	9	9	9	9
CO2	3	9	3	9	9	3	3
CO3	3	9	9	9	3	9	9
CO4	9	9	9	3	9	9	9
CO5	3	3	9	9	3	9	3
<b>Weightage</b>	<b>27</b>	<b>33</b>	<b>39</b>	<b>39</b>	<b>33</b>	<b>39</b>	<b>33</b>
<b>weighted percentage of course contribution of pos</b>	<b>3.5</b>	<b>4.5</b>	<b>6.3</b>	<b>6.1</b>	<b>5.9</b>	<b>6.0</b>	<b>5.6</b>

**Level of correlation between co's and po's**

**1-Low    3 – Medium    9- High    0 - No correlation**

**TEXT BOOKS:**

1. P.S.Verma: Advanced Practical in Zoology (S.Chand & Co).
2. S.S.Lal: Parctical Zoology: Chordates (Rastogi Publications).
3. K.Vijaraman and K.Palanivel: Cheymura vilangial: A complete Book (Chimera Trichy)

**III**  
***SEMESTER***

**SEMESTER – III –CC-IV**  
**21UZ04**

**HOURS/ WEEK – 5**  
**CREDIT- 4**

## **CELL BIOLOGY**

### **OBJECTIVES:**

- To enable the students to explore the intricacies of cell architecture and their complex biochemical interactions.
- This course facilitates to understand the structure at molecular level and function of prokaryote and eukaryote cell. To enlighten our students about the structures and functions of cellular organelles and types of cell division.

### **UNIT-I**

Types of cell – Prokaryotic and Eukaryotic: Ultra structure of prokaryotic and Eukaryotic cells Compound, light and Electron microscope, cytological techniques – fixation and staining- mechanism of staining

### **UNIT – II**

Plasma membrane – Ultra Structure and function, Physical and Chemical properties of plasma membrane Endoplasmic reticulum – Ultra Structure and functions and Golgi complex – structure and functions.

### **UNIIT - III**

Lysosome - Structure and functions, Mitochondria- Structure and functions, Ribosomes - Types, Ultra structure, Chemical composition and functions. Cytoskeleton and role in motility.

### **UNIT –IV**

Ultra Structure and functions of Nucleus and Nucleolus, Structure of DNA, RNA and their types - Chromosome – Structure and functions, Giant Chromosomes. Polytene chromosomes and Lamp brush chromosomes.

### **UNIT – V**

Cytological events during Cell cycle - Cell Division -Mitosis and Meiosis – Cancer and its characteristics, origin and types and diagnosis.

**Course outcome**

CO Number	CO Statement
CO1	To impart knowledge about the prokaryotic and eukaryotic cell, its complex organization, biosynthesis of cellular membranes and organelles and the unified role it plays for the ultimate sustainability of the organisms
CO2	Rigorous foundation in the principles of molecular and cellular biology give insights into the mechanisms involved in the synthesis and function of macromolecules such as DNA, RNA, and proteins
CO3	Ability to make connections between the molecular mechanisms, holistic understanding of biological organisation and function from the molecules to cells, tissues, organs and entire organism
CO4	Studying biochemistry and molecular cell biology trains the students to think logically, critically and quantitatively
CO5	Learn to interpret statements made in the scientific literature, as well as in non-science areas, based on evidence, not anecdotes

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	3	9	3	3	9	9
CO2	9	3	9	9	3	3	3
CO3	3	3	3	3	3	9	3
CO4	3	3	3	3	9	3	3
CO5	9	9	3	3	9	3	3
<b>Weightage</b>	<b>33</b>	<b>21</b>	<b>27</b>	<b>21</b>	<b>27</b>	<b>27</b>	<b>21</b>
<b>weighted percentage of course contribution of pos</b>	<b>4.3</b>	<b>2.9</b>	<b>4.3</b>	<b>3.2</b>	<b>4.8</b>	<b>4.1</b>	<b>3.5</b>

**Level of correlation between co's and po's**

**1-Low    3 – Medium    9- High    0 - No correlation**

**TEXT BOOKS:**

1. Verma, P.S, and Agarwal, V.K. (1998) Concept of Cell Biology, S.Chand & Co Ltd., New Delhi.
2. Power, C.B., 1989 Essentials of Cytology, Himalaya Publishing House.
3. M.L. Gupta and M.L.Jangir, (2011). Cell Biology, Fundamental and applications Agrobios publishers (P) Ltd.
4. Cell and Molecular biology – N.Arunpandi Student publications New Delhi 1

**REFERENCES**

- 1.De Robertis, E.D..P. and De Robertis, E.M.F. (1987), Cell and Molecular Biology, VIII Ed. Lea and Febiger, Philadelphia.
- 2.Cooper, J.M., Hausman, R.E. 2009. The Cell. Sinauer Associates, Inc., USA

**SEMESTER - III**  
**21USBE2**

**HOURS/ WEEK - 2**  
**CREDIT - 4**

## **SOFT SKILLS AND INDUSTRY AWARENESS - PAPER II**

Learning Objectives:

- i) To equip the learners for Group Discussion
- ii) To prepare the learners to attend interviews
- iii) To make the students to learn effective Time Management
- iv) To expose the learners to Retail Sector
- v) To initiate the learners into Retail Advertising

UNIT I:

Group Discussion --- Types of GD – discussion Vs debate – personality traits – advantages of GD --- Dos and Don'ts

UNIT –II:

Selection Interview – Introduction --- interview-meaning --- interview structure --- interview panel – types of interview ---questions looked for in interviews ---preparation before interview -----Body language –dos and don'ts ---standard interview questions ---your answer to questions

UNIT III:

Time Management – importance of time ---importance of time management –the Pareto 80 : 20 Principle and Time Management – the time management matrix --- its utilization ---procrastination : causes and effects --- how to overcome procrastination --- effective time management --- tools for effective time management

UNIT – IV

Retail Sector – introduction –market size -- investment scenario – advantage india --- government initiatives --- types of stores --- types of Merchandising -- Store operations – store appearance – store security – make it difficult for retail theft to happen --- inventory and stock management --- store organization --- importance of store organization

UNIT - V

Retail Advertising --- integrated marketing communication (IMC) – traditional marketing Vs IMC, Benefits of IMC—management of IMC in Retail --- sales promotion-- objectives, limitations, tools, Enterprise source Planning (ERP), supply chain management – the relationship between ERP, CRM, and SCM --- key features of supply chain management – job roles



Learning Outcomes:

- i) learners are confident enough to join Group Discussion
- ii) learners feel well-equipped to attend interviews
- iii) learners know the value of time and managing it
- iv) learners know the potential of Retail Sector
- v) Learners know about Retail Advertising

**PRESCRIBED BOOK:**

1. Soft Skills and Industry Awareness - ICT Academy of Tamil Nadu

**BOOKS FOR REFERENCE:**

1. Dr.Alex – Soft Skills, S.Chand, New Delhi
2. Raveendiran *et al.* Success through Soft Skills

**SEMESTER – III**  
**21UZON1**

**POULTRY SCIENCE**

**HOURS/ WEEK – 4**  
**CREDIT - 2**

**OBJECTIVES:**

- To develop knowledge on the history and the role of poultry in rural development and its structure.
- To learn the methods of rearing, breeding and production of poultry.
- To learn about the nutritional aspects of poultry and its by products
- To gain knowledge about the importance and the self-employment opportunities to the students.
- The role of different research organizations and funding agencies to promote poultry farming.

**UNIT-I**

Introduction – progress of poultry industry in India. Types of poultry-plymouth rock, Minorca, Red and White leghorn

**Unit-II**

Management – Practical aspects of chick rearing - Management of growers, layers and broilers – Lighting and temperature – Summer and Winter Management – debeaking

**UNIT-III**

Poultry Nutrition – Requirement - food additives and Feed ingredients and formulation

**UNIT-IV**

Diseases of poultry – viral, bacterial, fungal and parasitic diseases - symptoms and preventive measure.

**UNIT-V**

Factors affecting egg size – grading – storage, preservation methods and marketing –Economics of poultry industry.

**COURSE OUTCOMES**

CO1	Get knowledge about the importance of poultry farming
CO2	Understand the types of poultry breeding, rearing, and production of poultry.
CO3	Apply the knowledge in types of incubators for poultry breeding
CO4	Evaluate the importance of poultry marketing
CO5	Apply the knowledge in the preparation of feed, antibiotics, vaccines and marketing

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	9	9	3	3	3	3
CO2	3	3	9	3	3	3	3
CO3	9	3	3	3	3	3	9
CO4	3	3	3	9	3	3	3
CO5	9	3	3	3	3	9	3
Weightage	27	21	27	21	15	21	21
weighted percentage of course contribution of pos	3.5	2.9	4.3	3.2	2.6	3.2	3.5

**Level of correlation between co's and po's**

**1-Low 3 – Medium 9- High 0 - No correlation**

**TEXT BOOKS:**

1. Bioster , S.1989, Diseases of poultry , Oxford and IBH.
2. Felwal and Fox. 1992, proctical poultry feeding. ELBS Editing.
3. Singh. J and E.N. More. 1982. Liver tock and Poultry production. Prentice hall of india.
4. Ganamani, K.1997. Modern aspects of poultry keeping. Hytone publishers, Madurai

SEMESTER – III  
21UZON1

HOURS/ WEEK – 4  
CREDIT - 2

## ECONOMIC ZOOLOGY

(NME – FOR PHYSICAL EDUCATION STUDENTS)

### UNIT – I

**Pisciculture** – Commercial culture of Indian major carps (catla, catfish) – Techniques of induced breeding – Economic importance of fishes.

**Prawn culture** – Culture techniques of fresh water (*Macrobrachium rosenbergii*) and Marine water (*Penaeus monodon*) – Preservation methods and marketing of prawn.

**Pearl culture** – Types and formation of Pearls – commercial importance of pearl culture.

### UNIT – II

**Vermiculture** – Definition – Scope - Species of Earthworm – Methods of vermicomposting – vermibed – Advantages of vermicompost and vermicast – Vermiwash.

### UNIT – III

**Sericulture** - Definition – Scope – types of silk worms and silk – Rearing techniques of silkworm – Methods of silk reeling – Reeling operation – Mulberry planting system – Medicinal and Nutritive values of mulberry – Sericulture industry in India.

### UNIT – IV

**Apiculture** - Definition – Scope – Species of Honey bees – Types of beehives – Honey extraction – Storage of honey in chemical composition – Nutritional and medicinal values – Bee hives and other products.

### UNIT – V

**Poultry keeping** – Morphology of different breeds of Chicken – Brooding and Rearing of chicks – Processing of egg – Nutritive values of egg – Rearing of broilers – Meat and by products of poultry.

**Dairy farm management** – Milch breeds – Draught breeds – Dual purpose breeds – and new cross breeds.

**COURSE OUTCOMES**

CO1	Get knowledge about the characteristics and role of earthworm in sustainable agriculture.
CO2	Understand the problems in sericulture, apiculture and lac culture.
CO3	Apply the knowledge on disease management in the field of poultry and animal husbandry.
CO4	Analyze the economic importance of sericulture and apiculture
CO5	Analyze the economic importance of fisheries and aquaculture

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	3	3	9	3	9	3
CO2	3	3	3	3	9	3	3
CO3	3	3	9	9	3	3	1
CO4	9	9	3	3	3	3	9
CO5	9	3	3	9	3	9	3
<b>Weightage</b>	<b>33</b>	<b>21</b>	<b>21</b>	<b>33</b>	<b>21</b>	<b>27</b>	<b>19</b>
<b>weighted percentage of course contribution of pos</b>	<b>4.3</b>	<b>2.9</b>	<b>3.3</b>	<b>5.1</b>	<b>3.7</b>	<b>4.1</b>	<b>3.2</b>

**Level of correlation between co's and po's**

**1-Low    3 – Medium    9- High    0 - No correlation**

**TEXT BOOKS:**

1. Shukla, G.S and V.B. Upadhyay (2008) Economic Zoology, 4<sup>th</sup> ed. Rastogi Publication, Meerut.
2. Bhatnagar, R.K and Paltra, R. K. (1996), Vermiculture and Vermicomposting, Kalyani Publishers, New Delhi.
3. Madan Mohan Rao M.. (1998). A Text Book of Sericulture, B.S. Publications, Hyderabad.
4. Pradip V.Jabde (1993) Text book of Applied Zoology, Discovery publishing house, New Delhi.
5. Ayyappan, S, Jena,J.K, Gopalakrishnan, Aand A. K. Pandey. (2011), 7.Handbook of fisheries and aquaculture. Indian Council of Agricultural Research. Directorate of Information and Publications on Agriculture, , Indian Council of Agricultural Research, New Delhi, India.

**REFERENCES:**

1. Cherina, R. and K.Ramanathan 1992. Bee keeping in India.
2. Mishra, R.c., 1985, Honey bees and their management in India ICAR.
3. FAO, 1992, Sericulture Manual – 2 (Silkworm rearing). Oxford & IBH.
4. FAO, 1994. Sericulture Manual – 2 (Silk reeling). Oxford & IBH.
5. Nayar K.K and T.N. Anathakrishnan and B.V. David.(1983) General and applied Entomology, Tata McGraw Hill publishing Co. Ltd., New Delhi.
- 6.Fenemore P.G. A. Prakash. (2002) Applied Entomology, New age international (P) publishers, New delhi.
7. ManjuYadav. (2003) Economic Zoology, Discovery Publishing House, New Delhi.
- 8 .Fred V.Theobald. (1989) Economic Zoology, Print well Publisher. Jaipur. India.
9. Cunningham S, Dunn M.R and D.Whitmarsh. (1985) Fisheries Economics. St. Martin's Press.
- 10.Shang YC. (1981) Aquaculture Economics. Westview Press.
- 11.LokeshwarR. (2002) Hand Book of Animal Husbandry, ICAR, New Delhi

**IV**  
***SEMESTER***

**SEMESTER – IV**  
**21UZ05**

**HOURS/ WEEK – 5**  
**CREDIT - 4**

## **ECOLOGY**

### **OBJECTIVES:**

- To gain information about the environment of biotic and abiotic factors, bio-geo chemical cycles, Habitat, population ecology, pollution and their control measures.
- The toxicant related with environment, the toxic effects in different fields and to find out the environmental pollutants.
- To understand the concept of ecosystem and balance of nature.
- To know the fundamental principles that govern the functioning of the environment

### **UNIT-I**

Definition and scope of Ecology- Characteristics of ecology: Factors influencing ecology: Abiotic (Light, Temperature, Soil and water) and biotic (symbiosis, commensalism, mutualism, predation) Factors.

### **UNIT-II**

Biogeochemical cycle: Carbon cycle, Nitrogen cycle, Oxygen cycle, Phosphorous, Carbon di oxide and Sulphur cycle.

### **UNIT-III**

Ecosystem : Definition , types – Aquatic ecosystem – Pond, Terrestrial - Grassland – Characteristics features of forest, Food chain – Food web, Trophic level, Energy flow – Ecological pyramids.

### **UNIT – IV**

Population : Definition- natality,mortality, fecundity , genepool . Age of population.

Community : Types of community – Ecological succession.

Habitat: fresh water Characteristics and adaptation of lentic (ponds, lake) and lotic (river and marine) Muddy shore adaptations.

### **UNIT – V**

Water, Land, Air, Noise and Radioactive pollution and preventive measures.



Environmental impact assessment and National Environmental policy. Global warming.  
Wild life sanctuaries and National parks in India.

### Course Outcomes

CO1	Get knowledge about the ecological studies and their significance
CO2	Understand the interlink between living and nonliving resources for an ecosystem management
CO3	Acquire knowledge on Community and Habitat ecology at different geographical regions to enhance species specific management
CO4	Analyze the ecological significance and their management
CO5	To assess the relationship between environment and organisms

### Mapping course outcomes with Programme outcomes

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	3	9	3	3	3	9
CO2	9	3	3	3	3	3	3
CO3	3	9	3	9	9	9	3
CO4	3	3	3	3	3	3	3
CO5	9	3	3	3	9	3	9
<b>Weightage</b>	<b>27</b>	<b>21</b>	<b>21</b>	<b>21</b>	<b>27</b>	<b>21</b>	<b>27</b>
<b>weighted percentage of course contribution of pos</b>	<b>3.5</b>	<b>2.9</b>	<b>3.3</b>	<b>3.2</b>	<b>4.8</b>	<b>3.2</b>	<b>4.5</b>

Level of correlation between co's and po's

1-Low 3 – Medium 9- High 0 - No correlation

### **TEXT BOOKS**

1. Jeyaraj M. S. and Veerbala Rastogi. (2013). Animal ecology and Distribution of Animals, KedarnathRamnath publishers, Meerut, Delhi.
2. Odum, E.P. (1969). Fundamentals of Ecology. W.B. Saunders publications, London.

### **REFERENCE BOOKS**

1. Verma P. S. and V. K. Agarwal (1999). Environmental Biology. S. Chand & co, New Delhi.
2. Sharma, P. D. (2000). Ecology and Environment – Rostogi Publications, Meerut, India.
3. Agarwal, K. C. 1987. Environmental Biology - Agro Botanical Publisher, India.
4. Agarwal, V. K. and Usha Gupta. (2002). Ecology and Ethology - S.chand and Company Ramnagar, New Delhi.
5. Rastogi V. B and M.S Jayaraj 1989. Animal ecology and distributionof animal, Kedamath Ramnath

**SEMESTER - IV**  
**21UZ06**

**HOURS/ WEEK – 3**  
**CREDIT - 4**

**MAJOR PRACTICAL –II**  
**CELL BIOLOGY AND ECOLOGY**

**CELL BIOLOGY**

- i. Buccal smear - Preparation of squamous epithelial cells in man
- ii. Onion root tip - Squash preparation to study different stages of mitosis
- iii. Spotters and Models  
Tissue - Epithelial, Muscular, Neuron, Micrometer, Camera Lucida.

**ENVIRONMENTAL BIOLOGY**

- i. Estimation of Dissolved oxygen.
- ii. Estimation of Salinity.
- iii. Estimation of Co<sub>2</sub>.
- iv. Estimation of Calcium.
- v. Identification and Mounting of Marine and Fresh water Planktons

**SPOTTERS AND MODELS**

Animal association: identification, interstitial fauna of Rocky, Sandy and Muddy shores with examples in each category)

pH meter, Thermometer, Lux Meter, Secchi disc, Barometer, Raingauge

**Course Outcomes**

CO Number	CO Statement
CO1	Familiar with the mounting of Onion root tip - Squash preparation
CO2	Familiar with the mounting of Buccal smear - Preparation of squamous epithelial cells in man
CO3	Familiar with the estimation and Evaluation of Dissolved oxygen.and CO <sub>2</sub>
CO4	Familiar with the estimation and Evaluation of Total Dissolved salts and calcium
CO5	Evaluate the General characters of the Animal association and their identification

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	3	3	3	3	3	9
CO2	9	3	3	3	9	3	3
CO3	3	9	3	9	3	9	3
CO4	3	3	9	3	3	9	3
CO5	3	9	3	3	9	3	3
<b>Weightage</b>	<b>21</b>	<b>27</b>	<b>21</b>	<b>21</b>	<b>27</b>	<b>27</b>	<b>21</b>
<b>weighted percentage of course contribution of pos</b>	<b>2.7</b>	<b>3.7</b>	<b>3.3</b>	<b>3.2</b>	<b>4.8</b>	<b>4.1</b>	<b>3.5</b>

**Level of correlation between co's and po's**

**1-Low 3 – Medium 9- High 0 - No correlation**

**TEXT BOOKS:**

1. E.D.P DeRobertes and M.F.DeRobertes : Cell and molecular Biology (W.B.Saunders).
2. A.L. Giese, Cell physiology (W.B.Saunders)
3. P.S. Verma and V.K. Agarwal ;Cytology (S.Chand & co)
4. Agarwal, A.K. Ecology and Environmental Biology, Student Edition, Agrobios (India).
5. K.Vijayaraman and K.Palanivel (2019). Cheymurai Vilangial : A Complete book (Chimera)

**V**  
***SEMESTER***

**SEMESTER - V**  
**21UZ07**

**HOURS/ WEEK – 4**  
**CREDIT - 4**

## **BIOPHYSICS, BIO CHEMISTRY AND BIO STATISTICS**

### **OBJECTIVES:**

- Develop a fundamental understanding of basic concepts and tools in biophysics, biostatistics and bioinformatics
- Gives information about the biochemical and biophysical aspects related to living organisms. The life supporting molecules, their metabolism, biological oxidation and its relevance. Biophysical aspects and their properties.
- Gives information about the various statistical analyses of biological parameters.

### **UNIT –I -BIOPHYSICS**

Importance of biophysics: Colloids – Types, properties, Osmosis, Dialysis,-Beer Lamber’s law of light absorption –Spectroscopy and its application –Paper Chromatography.

### **UNIT-II BIOCHEMISTRY**

Structure and function of biomolecules: Protein – structure of protein (Primary Secondary, Tertiary and Quarternary) - Metabolism - Carbohydrates, Proteins and Lipids.

### **UNIT-III – ENZYME AND HORMONES**

Enzymes – Classification and Characteristics of enzymes, Vitamins: Type of vitamins – source, function, deficiency diseases - Hormones: Type of Male and Female hormones and their functions.

### **UNIT-IV BIOSTATISTICS**

Sampling techniques - collection and analysis of biological data.– Raw data, primary and secondary data, classification of tabulation. Measures of central tendency: Arithematic mean, median, mode, standard deviation and standard error. Coefficient of variation.

### **UNIT –V DIAGRAMMATIC REPRESENTATION OF DATA**

Graphical Representation: Bar diagram, Pie diagram, frequency polygon, frequency curve, histogram, Simple Correlation, simple regression.

**Course Outcome**

CO Number	CO Statement
CO1.	Develop a thorough grounding in fundamental analytical approaches for quantitative study of living systems and life processes. and to determine the physical phenomena which influence living organisms.
CO2.	Develop a fundamental understanding of basic concepts of biophysics biochemistry and biostatistics
CO3.	Application of physics to the study of biological molecules, living systems and life processes
CO4.	Shall know how to organize, manage, and present data. And the Fundamental statistical concepts and some of their basic applications in science and society
CO5.	To educate the interdisciplinary nature of advances in biophysics, biochemistry and biostatistics and Carrying out exercises or small projects that incorporate data presentation

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	9	3	3	1	3	3
CO2	9	9	3	3	3	3	3
CO3	9	3	9	3	3	9	9
CO4	3	3	3	9	3	3	3
CO5	9	3	9	3	3	3	9
<b>Weightage</b>	<b>39</b>	<b>27</b>	<b>27</b>	<b>21</b>	<b>13</b>	<b>21</b>	<b>27</b>
<b>weighted percentage of course contribution of pos</b>	<b>5.1</b>	<b>3.7</b>	<b>4.3</b>	<b>3.4</b>	<b>2.3</b>	<b>3.2</b>	<b>4.5</b>

**Level of correlation between co's and po's**

**1-Low    3 – Medium    9- High    0 - No correlation**

**TEXT BOOKS:**

1. Daniel, M., 1992 Basic Biologists's wiley International, NewDelhi
2. Das. A., 1996. Biophysics and Biological chemistry. Academic publishers, Calcutta.

**REFERENCE BOOKS**

1. Robert Murray : Harper's Biochemistry (G. Lange Medical Book)
2. L. Stryer : Biochemistry (Wiley International)
3. Ramakrishnan, P. 1995 Biostatistics, saras publication, Nagarcovil
4. Gurumani N. 2005 an International to Biostatistics Tamil Nadu Book House.



**SEMESTER - V**  
**21UZ08**

**HOURS/ WEEK – 4**  
**CREDIT - 4**

## **DEVELOPMENTAL BIOLOGY**

### **OBJECTIVES**

- This course provides the knowledge on the process of early embryonic development and review the current development in the field of embryology.
- The understanding about formation of embryo and embryological disorders and treatment methodology. Precaution and health care during pregnancy and gestation.
- To get knowledge about theories of development and gametogenesis
- To study the process of fertilization and cleavage of animals

### **UNIT – I**

Introduction and theories embryology - Gametogenesis and Fertilization: Gametogenesis in mammals - Structure of Mammalian sperm and ovum- theories of fertilization - Role of acrosome in fertilization- Physiological changes during fertilization.

### **UNIT – II**

Frog – cleavage, Planes and Patterns of cleavage - fate map, gastrulation – Physiology of gastrulation - Mechanism of morphogenetic movements of cells.

### **UNIT – III**

Organogenesis: Types of embryonic induction – theories of induction – Organizer theories. Organogenesis: Development of brain and eye in chick and frog.

### **UNIT – IV**

Metamorphosis and Regeneration: Hormonal control of metamorphosis in frog - types of regeneration - epimorphosis- morphallaxis and commonsatory regeneration (with one example).

### **UNIT – V**

Extra embryonic membranes and Placenta: Embryonic (Foetal) membranes in chick – 48 hours chick embryo. Placentation in mammals: Types of Placenta- concept of test tube baby – Parthenogenesis - Birth control – Nuclear transplantation techniques – Stem cell culture and its uses.

**Course Outcomes**

<b>CO1</b>	Study the laws and theories of development and gametogenesis.
<b>CO2</b>	Understand the process and different methods of fertilization.
<b>CO3</b>	Apply the knowledge on various developmental stages of animals.
<b>CO4</b>	Analyze the importance and gain knowledge on embryonic nutrition.
<b>CO5</b>	To understand the embryonic developmental stages and extra embryonic nutrition of animals

**Mapping course outcomes with Programme outcomes**

<b>CO \ PO</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>
<b>CO1</b>	9	3	3	9	3	3	3
<b>CO2</b>	3	3	3	3	3	3	9
<b>CO3</b>	9	3	3	3	3	3	3
<b>CO4</b>	3	9	3	9	3	9	3
<b>CO5</b>	3	3	9	3	9	3	3
<b>Weightage</b>	<b>27</b>	<b>21</b>	<b>21</b>	<b>27</b>	<b>21</b>	<b>21</b>	<b>21</b>
<b>weighted percentage of course contribution of pos</b>	<b>3.5</b>	<b>2.9</b>	<b>3.3</b>	<b>4.2</b>	<b>3.7</b>	<b>3.2</b>	<b>3.5</b>

**Level of correlation between co's and po's**

**1-Low    3 – Medium    9- High    0 - No correlation**

**TEXT BOOKS:**

1. Verma P.S. and Agarwal V.K. (1996). Chordate embryology (Chand & Co), New Delhi.

**REFERENCE BOOK**

2. Jain, P.C. (1994). Development Biology, vishal publications, Jalandhar
3. Balinsky, B.J.(1981) An Introduction to embryology, CBS College publishing, holt, Rinehart and winston.

**SEMESTER - V**  
**21UZ09**

**HOURS/ WEEK – 5**  
**CREDIT - 4**

## **GENETICS**

### **OBJECTIVES:**

- To understand the fundamental concepts of genetics, the principles and mechanism of inheritance and the origin and evolutionary process of organisms
- To understand the functional concepts of genetics, human related genetic problems, inborn errors and genetic counseling.
- To acquire knowledge on the applied branches of genetics.

### **UNIT-I**

Mendelism: Mendelian laws of inheritance, Mono hybrid and di hybrid cross, Interaction of genes – Supplementary, Epistasis, Lethal genes- types Multiple alleles: Blood groups and their inheritance (ABO &, Rh factor).

### **UNIT-II**

Mutation: Gene mutation, DNA repair mechanism, chromosomal aberrations, – Extra chromosomal inheritance - Kappa particles in paramecium – Sex linked inheritance – Colour blindness.

### **UNIT – III**

Linkage Crossing Over and Sex Determination: Linkage types- Mechanism (Eg. Drosophilla) Crossing Over types- Mechanism (Eg. Drosophilla). Factors affecting crossing over. Sex determination: Barr body, Chromosomal, Environmental. Free martin – Gynandromorphs

### **UNIT – IV**

Molecular Genetics : Gene concept, Transcription – Genetic code. Microbial Genetics: Recombination in bacteria – conjugation – Transformation – Transduction and sex duction.

### **UNIT – V**

Human Genetics: Human Karyo type – Preparation of karyo type Pedigree analysis. Syndrome: (Kline felter – Turner – Down) Inborn errors of metabolism: (phenyl ketoneuria, Alkaptonuria) Simple Mendelian Traits in man -. Gene therapy - methods, cancer therapy, Eugenics –Euthenics.

**Course Outcomes**

CO Number	CO Statement
CO1	Understand the core principles of genetics, the historical background, genetic crosses, basic laws governing the pattern of qualitative characters, linkage and crossing over.
CO2	Apply knowledge about transcription, translation and the genetic code to understand the flow of genetic information from DNA to proteins
CO3	Understanding the applications of genetics for the welfare of health and treatment of disease, and the impact of selective advantage and natural selection on human genetic disorders.
CO4	To understand the evolutionary events those has occurred throughout Earth's geological history starting with the hypotheses on the origin of life and identify the key events in human evolution. Know how to obtain current information about scientific and clinical applications of genetics, particularly from specialized genetics services.
CO5	Analyze the processes in population genetics and describe how they affect the genetic diversity within a species Compare and contrast the various theories on formation of new species and identify the factors that play a role in the process of evolution and understand the genetic basis of evolutionary change.

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	9	3	3	1	3	3
CO2	9	3	3	3	3	3	3
CO3	9	3	3	3	9	3	3
CO4	3	9	3	9	3	3	9
CO5	9	3	9	3	3	9	3
Weightage	39	27	21	21	19	21	21
weighted percentage of course contribution of pos	5.1	3.7	3.3	3.2	3.4	3.2	3.5

Level of correlation between co's and po's

**1-Low    3 – Medium    9- High    0 - No correlation**

**TEXT BOOKS:**

1. Peter J.Russell – 2000. Fundamentals of genetics. 2<sup>nd</sup> edition.

**REFERENCE BOOKS:**

1. Goodenough, U., 1997, Genetics, Saunders college publishing international New York
2. P.S Verma and V.K.Agarwal: Genetics(Chand & Co)
3. D.Frie felder: microbial genetics(Narosa publishing)
4. J.D. Haukins: Gene structure and function (Cambridge university press)

**SEMESTER – V**  
**21UZOE1A**

**HOURS/ WEEK – 5**  
**CREDIT- 5**

## **BIOTECHNOLOGY**

### **Objectives:**

- This paper deals with the applied aspects of biotechnology in medical, agricultural, industrial, microbial and environmental fields. The uses of the recombinant techniques and its application for the betterment of mankind.
- Upon successful completion of this course the students recognize the foundation of modern biotechnology, principles and the different applications of biotechnology

### **UNIT – I**

Definition, scope and significance of biotechnology: Introduction to Genetic Engineering: restriction enzymes, Types, restriction sites, Types of ends and its significance - Gene cloning vectors (plasmids)- mechanism of gene cloning in eukaryotes

### **UNIT – II**

Molecular techniques: Agarose Gel Electrophoresis, Southern and Western blotting- Construction of Gene library and cDNA library – Polymerase Chain Reaction, RT- PCR, Hybridoma technology and monoclonal antibodies- applications of biotechnology in medicine.

### **UNIT –III**

Enzyme technology: Isolation of enzymes and purification of enzymes-dialysis, salting out, salting in, Ammonium sulphate fractionation, column chromatography, immobilization of enzymes- application of Enzyme in different fields.

### **UNIT-IV**

Industrial Bio Technology: Basic structure and types of fermentor (bioreactor) –Types of fermentation wine production using fermentation technology – application of biotechnology in Pharmaceutical industry.

### **UNIT-V**

Agricultural Biotechnology: Biofertilizer and its uses, Production of Transgenic animals. Transgenic plants- disease resistant, stress resistant (salt and drought). Edible vaccine Single cell protein (spirulina) and its uses.

**Course outcome**

CO Number	CO Statement
CO1	To impart comprehensive understanding of the principles and practices of biotechnology.
CO2	Understanding the principles and practices of biotechnology give insights into the DNA Technology, Technique of genetic engineering, DNA Finger printing, Methods of DNA profiling and animal tissue culture.
CO3	Application of genetic engineering in prevention and diagnosis of diseases and discuss the different applications of biotechnology
CO4	Understanding the application of genetic engineering, DNA Finger printing, DNA profiling and animal tissue culture in Life Sciences Research trains the students to think logically.
CO5	Interpretation will empower students to think and solve problems in the field of biotechnology.

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	3	3	9	3	3	3
CO2	9	3	9	3	9	3	3
CO3	3	9	3	3	3	3	3
CO4	9	3	9	3	9	1	9
CO5	3	9	3	9	1	9	9
Weightage	27	27	27	27	25	19	27
weighted percentage of course contribution of pos	3.5	3.7	4.3	4.2	4.4	2.9	4.5

**Level of correlation between co's and po's**

**1-Low    3 – Medium    9- High    0 - No correlation**



**TEXT BOOKS:**

1. R.Primrose: Molecular Biotechnology (ASM press, Washington)
2. B.R Glick and J.J Pasternack; Molecular Biotechnology (ASM press, Washington)
3. S. Damond and T.Nicholl; Generic engineering (Cambridge university press)
4. P.K. Gupta; Elements of Biotechnology (Rastogi publication)
5. Vijayaraman, K.S.Chellammal and P.Manikilli.1998.Uyirithozhilnutpam, Chimera.
6. Biotechnology - S.S.Purohit (2010). Agrobios publishers (P) Ltd.,Jodhpur.

**SEMESTER – V**  
**21UZOE1B**

**HOURS/ WEEK – 5**  
**CREDIT 5**

## **BIO INSTRUMENTATION**

### **OBJECTIVES:**

The main aim of this paper is to provide the principle and the working knowledge of various instruments used in the laboratory to the students.

### **UNIT I**

Microscopy – Principle and application – Light microscope, Phase contrast microscope and Fluorescent Microscope, Electron microscope – SEM, Steps involved in Cryostat, sectioning and staining. Flow cytometry.

### **UNIT II**

pH meter, Analytical balance, Centrifuge and its types Colorimeter. Principle and application - Spectroscopy - UV Visible Spectrophotometer, Atomic Absorption Spectroscopy.

### **UNIT III**

Chromatography: Principle, instrumentation and applications of - Paper, thin layer chromatography and Column chromatography Gas chromatography(GC). Electrophoresis- AGE and PAGE.

### **UNIT IV**

DNA Fingerprinting techniques, Southern blotting, ELISA, Western blotting, Biosensors and Biochips – Principle and applications of PCR. Bioreactors and its types

### **UNIT V**

First-aid methods, Good Laboratory practices, Management and safety, Safe disposal of laboratory wastes. Cleaning care and sterilization of laboratory items – dry and wet (flame, steam, and chemical sterilization).

**COURSE OUT COMES**

CO1	Get knowledge about the characteristics and role of Microscopy
CO2	Evaluate the problems in Chromatography: Principle, instrumentation and applications
CO3	Apply the knowledge on DNA Fingerprinting techniques
CO4	Analyze the First-aid methods ,Good Laboratory practices
CO5	Analyze the Management and safety aspects, Safe disposal of laboratory wastes. Cleaning care and sterilization of laboratory items

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	3	3	3	3	3	9
CO2	3	9	3	3	3	3	3
CO3	3	3	9	9	3	3	3
CO4	9	3	3	3	9	3	3
CO5	3	3	9	9	3	9	9
Weightage	27	21	27	27	21	21	27
weighted percentage of course contribution of pos	3.5	2.9	4.3	4.2	3.7	3.2	4.5

Level of correlation between co's and po's  
 1-Low 3 – Medium 9- High 0 - No correlation

**TEXT BOOKS:**

1..Bhawana Pandey M.H. Fulekar 2019. Bioinstrumentation Wiley publication

**REFERENCES:**

1. Daniel, M., 1992, Basic Biology, Wiley International, NewDelhi.
2. Das. A., 1996. Biophysics and Biological chemistry. Academic publishers, Calcutta.
3. P.K. Gupta; Elements of Biotechnology (Rastogi publication), New Delhi.
4. P.S. Verma and V.K. Agarwal; Cytology, S.Chand & Co, New Delhi.

**SEMESTER – V**  
**21UZOE1C**

**HOURS/ WEEK – 5**  
**CREDIT 5**

## **ANIMAL BEHAVIOUR**

### **COURSE OBJECTIVE:**

The main objective of this course is to introduce the student about various behaviour of animals and its application in welfare of the animal community

### **UNIT-I**

Introduction: The science of animal behavior-brief history. Diversity and unity in the study of behaviour and complex behaviour. Development of behaviour: Accommodative and Associate learning. Hormones and early development. Genetic basis of behaviour. Neural control of behaviour.

### **UNIT-II**

Stereotyped behaviour: Kinesis, taxis, orientation and reflexes. Motivation and conflict behaviour: decision making on different scales, drive, models of motivation, stress, territorial conflicts, threat display, displacement activities and fighting as conflict behaviour.

### **UNIT-III**

Stimuli and communication: Diverse sensory capacities, sign stimuli, stimulus filtering. Communication. Ecological aspects of behaviour: Habitat selection, food selection, optimal foraging theory, anti-predator defenses. Aggression, homing, territoriality, dispersal. Host-parasite relations.

### **UNIT-IV**

Courtship and ritual behaviour: Mate selection, male-male selection, female choice and maternal behaviour. Social organizations in insects and primates. Biological rhythms: Circadian and circannual rhythms.

### **UNIT-V**

Hormones and behaviour: Pheromones and their biological actions in vertebrates and invertebrates. Chemical communication, body coloration, social life in insects (Termites and honey bees). Hormone in insect & crustacean metamorphosis.

**COURSE OUT COMES**

CO1	Get knowledge about the characteristics of animal behaviour
CO2	Evaluate the problems associated with animal behaviour
CO3	Evaluate and Apply the knowledge on Stimuli and communication associated with animal behaviour
CO4	Evaluate and Analyze the Courtship and ritual behavior of animals
CO5	Analyze and Get knowledge about the Hormones involved in animal behaviour

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	3	9	9	9	9	9
CO2	3	9	3	9	9	3	3
CO3	3	9	9	9	3	9	9
CO4	9	9	9	3	9	9	9
CO5	3	3	9	9	3	9	3
<b>Weightage</b>	<b>27</b>	<b>33</b>	<b>39</b>	<b>39</b>	<b>33</b>	<b>39</b>	<b>33</b>
<b>weighted percentage of course contribution of pos</b>	<b>3.5</b>	<b>4.5</b>	<b>6.3</b>	<b>6.1</b>	<b>5.9</b>	<b>6.0</b>	<b>5.6</b>

**Level of correlation between co's and po's**

**1-Low 3 – Medium 9- High 0 - No correlation**

**TEXT BOOKS:**

1. Aubrey Manning and Marian. S. Dawkins. 1995. *An Introduction to Animal Behaviour*. Cambridge University Press, 1995.

2. McFarland. D. *The Oxford Companion to Animal Behaviour*.

**REFERENCE BOOKS:**

1. McFarland. D. 1985. *Animal Behaviour Psychology, Ethology and Evolution*. Pitman Publications.

2. Slater. P.J.B. 1999. *Essentials of Animal Behaviour*. Cambridge University Press, 1999.

SEMESTER – V  
21UZON2

HOURS/ WEEK – 2  
CREDIT- 2

## PUBLIC HEALTH AND HYGIENE

Objectives:

To give the students awareness about public health aspects and the importance and necessity of hygiene practices. For healthy life.

### UNIT – I

Scope of Health and hygiene – History of public health in India – Nutrition and health: classification of foods. Growth and development – growth chart, nutritional deficiency diseases- nutritional requirements for special groups – Balanced diet.

### UNIT- II

#### **Environment and Health Management**

**Water:** water standards and purification of water

**Air:** Ventilation, discomfort prevention of pollution, Green house effect.

**Noise pollution:** Effects and prevention

**Land pollution**

### UNIT – III

**Communicable Disease:** Small pox, Measles, Mumps, influenza, Tuberculosis, Corona

**Intestinal infections:** Cholera, Typhoid, Amoebiosis

**Arthropod Borne infection:** Malaria, Filariasis, Dengue

**Zoonosis:** Rabies, Encephalitis and plague

### UNIT – IV

**Non communicable Diseases:** Coronary heart diseases, stroke, hypertension, diabetes mellitus, obesity, blindness

### UNIT –V

**Environmental health hazards:** Physical, Biological, Mechanical, social, Chemical and Psychological hazards.

**Mental Health:** Alcohol and drug abuses, Types, Causes and prevention of mental health

**Health Education:** Health plans of India – role of National and international organization (WHO) in the Health care of the community.

**COURSE OUT COMES**

<b>CO 1</b>	Evaluate the application and Scope of Health and hygiene
<b>CO 2</b>	understand and analyse the principles and applications Environment and Health Management
<b>CO 3</b>	understand and analyse the principles of Communicable Disease
<b>CO 4</b>	understand and analyse the types of Non communicable Diseases
<b>CO 5</b>	Evaluate the application and Familiar with Environmental health hazards and Mental Health

**Mapping course outcomes with Programme outcomes**

<b>CO \ PO</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>
<b>CO1</b>	<b>9</b>	<b>9</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>
<b>CO2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>9</b>	<b>3</b>	<b>3</b>	<b>9</b>
<b>CO3</b>	<b>9</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>9</b>	<b>3</b>
<b>CO4</b>	<b>9</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>9</b>	<b>3</b>	<b>3</b>
<b>CO5</b>	<b>3</b>	<b>9</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>1</b>
<b>Weightage</b>	<b>33</b>	<b>27</b>	<b>13</b>	<b>21</b>	<b>17</b>	<b>21</b>	<b>19</b>
<b>weighted percentage of course contribution of pos</b>	<b>4.3</b>	<b>3.7</b>	<b>2.1</b>	<b>3.2</b>	<b>3</b>	<b>3.2</b>	<b>3.2</b>

**Level of correlation between co's and po's**

**1-Low 3 – Medium 9- High 0 - No correlation**

**REFERENCES:**

- 1.Bauman, R.2007. Microbiology with diseases by Taxonomy. Benjamin Cummings.
- 2.Park, K.2002. Park's Text Book of preventive and social Medicine. 17<sup>th</sup> Edition., M/s. Banaaridas Bhanot publishers.



SEMESTER – V  
21UZON2

HOURS/ WEEK – 2  
CREDIT - 2

## APICULTURE AND SERICULTURE

### Objectives:

The main aim is to provide information about the culture of silkworm and honey bees. It gives an idea for the self-employment opportunities to the students and idea about the role of different research organizations and funding agencies to promote sericulture and apiculture.

### UNIT – I

**Apiculture:** Definition and Scope, Species of honey bees, social workers in bees – life history of honey bee.

### UNIT – II

Food of the honey bee, Honey and Pollen artificial feeding behavior of bees – dances, Bee colony, castes – Natural colonies and their yield – Types of hives – structure – location - Queen rearing methods. Modern Bee Keeping.

### UNIT – III

Extraction, Storage and Chemical composition of honey, Nutritive and medicinal values. Bee hives and other products - Prospect of apiculture and self employment – Present status of Apiculture in India.

### UNIT – IV

**Sericulture:** Introduction, types, importance and its role in economic development, status of sericulture industry in India. - Moriculture and propagation method – Diseases of mulberry and preventive measures.

### UNIT – V

**Silkworm:** Types of Silkworm – types of silks - Life history of *Bombyx mori* – Rearing techniques of silkworm- diseases of silk worm - silk reeling methods - Economic importance of silk in india.

**COURSE OUT COMES**

<b>CO 1</b>	Comprehend the structure, life cycle and various species of silkworm
<b>CO 2</b>	Understand the cultivation, harvest and preservation of mulberry leaves
<b>CO 3</b>	Analyze the genetics in the development of new strains
<b>CO 4</b>	Understand and analyze the different pests infecting silkworm and their control
<b>CO 5</b>	Analyze and Understand the silkworm rearing and silk thread reeling in developing silk farm

**Mapping course outcomes with Programme outcomes**

<b>CO \ PO</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>
<b>CO1</b>	9	9	9	3	1	3	1
<b>CO2</b>	3	3	3	3	3	3	3
<b>CO3</b>	3	3	1	3	3	3	3
<b>CO4</b>	9	3	3	3	3	9	3
<b>CO5</b>	3	9	3	9	1	9	3
<b>Weightage</b>	<b>27</b>	<b>27</b>	<b>19</b>	<b>21</b>	<b>11</b>	<b>27</b>	<b>13</b>
<b>weighted percentage of course contribution of pos</b>	<b>3.5</b>	<b>3.7</b>	<b>3</b>	<b>3.2</b>	<b>1.9</b>	<b>4.1</b>	<b>2.2</b>

**Level of correlation between co's and po's**

**1-Low 3 – Medium 9- High 0 - No correlation**

**TEXT BOOKS:**

1. Mishra, R.c., 1985, Honey bees and their management in India ICAR

**REFERENCES:**

1. Cherina, R. and K.Ramanathan 1992 Bee keeping in India.

2. FAO, 1992, Sericulture Manual – 2 (Silkworm rearing). Oxford & IBH.

3. FAO, 1994. Sericulture Manual – 2 (Silk reeling). Oxford & IBH.

**SEMESTER – V**  
**21USBE3**

**HOURS/ WEEK – 4**  
**CREDIT - 2**

### **SOFT SKILLS AND INDUSTRY AWARENESS - PAPER III**

Learning Objectives:

- i) To expose the learners to effective vocabulary
- ii) To introduce various kinds of leadership to the learners
- iii) To make the learners aware of the features of BFSI Sector
- iv) To make the learners aware of the potential of Insurance Sector
- v) To expose the learners to the fields of BPO and Hotel Industry

#### **UNIT – I**

**VOCABULARY ENRICHMENT** : Definition and importance – word formation : prefixes and suffixes - compound words - compound nouns – compound adjectives - synonyms and antonyms - homonyms – homophones - idioms and phrases - one word substitutes - confused words –tips for vocabulary enrichment - oral presentation : techniques and tasks - self –introduction- talking about objects - description of person - welcome speech - vote of thanks.

#### **UNIT II:**

**LEADERSHIP** -need for leadership –definition of leadership --- essence of leadership –functions of effective leaders ---differences between leadership and management -positive and negative leaders - different leadership styles - David McClelland’s classification of leadership – choice of correct leadership style - emerging perspectives on leadership in organizations

#### **UNIT – III**

**BFSI SECTOR:** Banking sector - market size – investments - what is banking? - types of banks - functions of Bank - types of bank accounts – E-banking (electronic banking) - government initiatives -Financial Services - Market size – Investments - Government Initiatives

#### **UNIT IV**

**INSURANCE SECTOR** :Market size - investments – advantage India - Policy measures - opportunities --- government initiatives – advantages and uniqueness of India’s

Life Insurance Sector-Job roles - ITES SECTOR - introduction – IT services sector -BPO Services sector - market size – investments - skill requirements in the IT and ITES industry-major trends impacting skill requirements.

#### **UNIT – V**

**BUSINESS PROCESS OUTSOURCING(BPO)** :Advantages of BPO - disadvantages of BPO - classification of BPO hospitality sector : introduction -tourism – Indian market - market size - investments - government initiatives - types of tourism - opportunities - benefits of career – road ahead - Theme parks - facts on Indian amusement park industry - structure and development of amusement park sector - tourism - amusement parks -recreation industry - amusement parks - hotel industry - categorization of hotels - latest developments - cruise lines - India’s cruise potential - time for domestic cruising – cruise lines in India - Job Roles.

#### **PRESCRIBED BOOK:**

1. Soft Skills and Industry Awareness - ICT Academy of Tamil Nadu

#### **BOOKS FOR REFERENCE:**

1. Dr.Alex – Soft Skills, S.Chand, New Delhi
2. Raveendiran *et al.* Success through Soft Skills

**VI**  
***SEMESTER***

SEMESTER - VI  
21UZO10

HOURS/ WEEK – 5  
CREDIT- 5

## ANIMAL PHYSIOLOGY

### OBJECTIVES:

- Physiology is the fountain head of “Natural Sciences” as it deals with the functions of the body of organisms. Emphasis on interrelationships among systems and regulation of physiological functions involved in maintaining homeostasis.
- The reactions are vehicled through chemical co –ordination of hormones – hence this combined subject on physiology and endocrinology is prescribed.
- Animal Physiology helps the students in understanding how the body functions adapts with respect to its external and internal environment, related to nervous integration, sensation, metabolism and reproduction.

### UNIT – I

**Nutrition:** Types of Nutrition, Nutrition requirement – balanced diet - Deficiency, Digestive systems – Structure of digestion in man - Structure, digestive glands, digestion of food - digestion and mechanism process in digestion absorption of carbohydrates, lipids and proteins.

### UNIT – II

**Respiration and Circulation:** Respiratory - pigment - Mechanism of respiration in man- Transport of respiratory gases- Respiratory quotient. Structure of human heart- Composition of blood - Cardiac cycle- ECG, EEG.

### UNIT III

**Excretion:** Structure of human Kidney–Ultra structure of Nephron, Mechanism of urine formation in man, **Osmoregulation:** Mechanism of Osmo regulation in fresh water and marine water fishes. **Muscle:** Type of muscles - Ultra structure and physiology of contraction and relaxations of muscles.

### UNIT- IV

**Nervous system:** Structure of Neuron – and its types, mechanism and conduction of nerve impulse – synaptic transmission- Reflex action- Reflex arch- **Receptors:** Phono, chemo and photo receptors (structure and function).

### UNIT – V

**Endocrine glands:** Adenohypophysis- Neurohypopophysis -, Structure and function of pituitary, Thyroid, parathyroid, pancreas, Adrenal,– Endocrine control of mammalian reproduction, sex hormones - Role of hormones in estrous cycle- Hormonal control of menstrual cycle, pregnancy, lactation and menopause.

**COURSE OUT COMES**

CO Number	CO Statement
CO1	To understand the basic organization of organisms and subsequent development to an organ system.
CO2	To analyze the physiological processes that regulates body functions and the regulation of an organ system from the molecular all the way to the whole animal level.
CO3	Recognize the complimentary relationship of structure and function and describe the interactions between different organ systems to maintain homeostasis
CO4	Able to explain the role of the endocrine glands in maintaining homeostatic mechanisms utilized by each body system in response to internal and external environmental changes.
CO5	To compare the impact and changes of different and to apply knowledge of a physiological mechanism for further understanding of the cellular and molecular mechanisms of action in health and disease.

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	9	3	3	3	9	3
CO2	9	3	3	3	3	3	3
CO3	3	3	1	3	3	3	1
CO4	3	9	3	9	9	9	3
CO5	3	9	3	3	1	9	3
Weightage	27	33	13	21	19	33	13
weighted percentage of course contribution of pos	3.5	4.5	2.1	3.2	3.4	5	2.2

**Level of correlation between co's and po's**

**1-Low    3 – Medium    9- High    0 - No correlation**



**TEXT BOOKS:**

1. Rastogi, S.C., 2001 Essential of animal physiology. Third Edition, New Age international publication, New Delhi
2. Verma, Tyagi and Agarwal 2000 Animal physiology S.Chand and company Ltd., New Delhi
3. Text Book of Human Physiology (2010)- C.chaterjee
4. Text Book of Chemistry & Physiology (2009) Arun book publishers.

**SEMESTER - VI**  
**21UZO11**

**HOURS/ WEEK – 5**  
**CREDIT - 5**

## **EVOLUTION**

### **OBJECTIVES:**

It provides basic information of phylogenies and evolution and to study the geological time scale and evolution of higher organisms from lower.

### **UNIT – I**

: Introduction- origin of life – Abiogenesis, Biogenesis – Urey and Miller experiment. Geological time scale. Theories of organic evolution - Lamarckism- Neo Lamarckism – Darwin’s finches - Darwinism - Neo-Darwinism – Mutation Theory of Devries.

### **UNIT – II**

Evidences for Evolution: Morphological, Embryological evidences, Geographical evidences, Fossil - types of fossils- Zoogeography.

### **UNIT – III**

Species concept and speciation: Species, Subspecies and Sibling Species. Types of speciation: Pyretic and true speciation - Hardy Weinberg equilibrium - Isolating mechanisms: Geographical isolation - Pre zygotic- Post zygotic isolation.

### **UNIT –IV**

Evolutionary process: Micro and Macro evolution; Parallel evolution- Mimicry and colouration – Adaptive radiation - types of adaptive radiation- adaptive radiation mammals.

### **UNIT –V**

Evolution of Man: Organic evolution of man - fossil evidence - Cultural Evolution of man – cyborgs.

**COURSE OUTCOMES:**

<b>CO1</b>	Understand the theories and concepts of evolution
<b>CO2</b>	Explain the process of evolution in animals
<b>CO3</b>	Compare and understand the evolution of social life in animals
<b>CO4</b>	Analyze the patterns of evolutionary changes in animals and the population dynamics, speciation and types of evolution
<b>CO5</b>	Interpret the ecological interaction, adaptation of animals and the Evolutionary process involved in: Micro and Macro evolution and Organic evolution of man

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	3	3	3	1	3	3
CO2	3	9	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	9	9	1	9	3	9	3
CO5	9	9	9	3	9	3	3
<b>Weightage</b>	<b>33</b>	<b>33</b>	<b>19</b>	<b>21</b>	<b>19</b>	<b>21</b>	<b>15</b>
<b>weighted percentage of course contribution of pos</b>	<b>4.3</b>	<b>4.5</b>	<b>3</b>	<b>3.2</b>	<b>3.4</b>	<b>3.2</b>	<b>2.5</b>

Level of correlation between co's and po's

1-Low 3 – Medium 9- High 0 - No correlation

**TEXT BOOKS:**

1. Bala Rastogi (2001) Organic evolution, Kedar nath & Ram Nath, Delhi
2. P.S. and Agarwal V.K. (1998). Concept of evolution, S.Chand & Co, New Delhi.

**REFERENCES:**

1. Ranganathan, T.K.1983. Evolution. CMS printing press.
2. Tomar , B.S. and S.P. Singh. Evolutionary Biology, Rastogi publications, Meerut.

**SEMESTER - VI**  
**21UZO12**

**HOURS/ WEEK – 4**  
**CREDIT - 4**

## **IMMUNOLOGY**

### **Objectives:**

- To understand the basic immunological principles, structural and functional basis of immunoglobulins, the mechanism, and application of antigen-reaction in the immune system.
- To obtain knowledge about immune systems, cells of immunity and its role in protection of our body .Antigen, antibody concepts, hypersensitivity, MHC and complement pathways.
- To obtain knowledge about Different immunological techniques used in the clinical testing.

### **UNIT – I**

Introduction and history, scope of immunology, definition of antigen, immunogen and antibody, definition for epitopes, and paratopes, types of immunity – innate and acquired immunity, lymphoid organs – primary and secondary. Structure and functions of lymphoid organs

### **UNIT – II**

Cells of immune system: Origin of the cells, Structure and types – Structure and functions of Monocytes, leucocytes, neutrophils, basophils, eosinophils, T cells and B cells.

### **UNIT – III**

Types of antigens, Basic structure of immunoglobulins and its types, functions of different classes of antibodies, Routes of immunization, properties of immune response, humoral immunity and cell mediated immunity.

### **UNIT – IV**

Auto immunity: Auto immune disorders – cause Eg: Myasthenia gravis and Lupusrthematusus-Principle of Vaccination-Types of Vaccines-Transplantation immunology: organ transplantation , graft rejection.

### **UNIT – V**

Immunological techniques: Precipitation reactions, Immunoelectrophoresis, ELISA, Western blotting- VDRL test , Widal test, FISH and ABO blood typing.

**COURSE OUT COMES**

CO Number	CO Statement
CO1.	The mechanisms and differences between primary and secondary responses and their relevance to immunizations
CO2.	Comprehensive and practical understanding of basic immunological principles and techniques involved in research/clinical/applied science
CO3.	Identify the role of antigen presenting cells, lymphocytes, and phagocytic cells in immune responses
CO4.	Role of immunology in protection against disease and autoimmune disorders
CO5.	Advanced knowledge of the underlying principles of immunology and its application in biological systems.

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	9	3	3	3	3	3
CO2	9	3	9	9	3	9	3
CO3	3	9	3	3	3	3	3
CO4	9	3	9	3	3	3	3
CO5	3	3	3	3	3	9	9
Weightage	33	27	27	21	15	27	21
weighted percentage of course contribution of pos	4.3	3.7	4.3	3.2	2.6	4.1	3.5

Level of correlation between co's and po's

1-Low    3 – Medium    9- High    0 - No correlation

**TEXT BOOKS:**

1. Chakaravathy, Ashik. (1996) Immunology, Tata MC Graw – Hill publishing company LTD., Delhi.

**REFERENCES:**

1. Roit and Delves (2001) Essential immunology, Black well science, London.
2. Clark, W.R., 1991. The experimental foundations of modern Immunology, John volley & sons.
3. Roiffy, J.M. 1998 Essentials of Immunology, Black well scientific publishers.
4. Immunology and serology (2011) K.R.joshi, N.O.Osam. Agrobios publishers jodhpur

**SEMESTER - VI**  
**21UZO13**

**HOURS/ WEEK – 3**  
**CREDIT -4**

**MAJOR PRACTICAL –III**  
**GENETICS, DEVELOPMENTAL BIOLOGY, BIOPHYSICS, BIOCHEMISTRY**  
**AND BIOSTATISTICS**

**GENETICS:**

- Identification of Blood Group and Rh Factors.
- Identification and Recording of Mendelian traits in humans.
- Drosophila mutants, male and female identification.
- Pedigree analysis
- Models – a) Drosophila male and female b) DNA doublehelix model

**DEVELOPMENTAL BIOLOGY:**

- Frog: Observation of frog's developmental stages – Egg, cleavage, Gastrulation and yolk plugs stage.
- Observation of the developmental stages of chick embryo 24 Hrs, 48 Hrs and 72 Hrs
- Observation of early developmental stages of frog (Metamorphosis)
- Slides: T.S. of Mammalian Sperm & Ovary

**BIOPHYSICS:**

- Beer – Lambert's law verification using colorimeter.
- Separation of molecules using paper chromatography
- Model - Spectrophotometer

**BIOCHEMISTRY**

- Qualitative test for proteins, lipids and carbohydrates
- Models – Glycolysis , Krebs cycle
- Haemoglobin, and ATP.

**BIOSTATISTICS:**

Calculation of, Mean, Median, Mode. Variance, Standard deviation, Standard error.  
Diagram construction – Bar, Histogram, and Pie Diagram.

**COURSE OUT COMES**

CO Number	CO Statement
CO1.	Evaluate The mechanisms involved in Enumeration of Blood Group and Rh Factors
CO2.	Analyse and Identification and Recording of Mendelian traits in humans
CO3.	Analysis and Observation of the developmental stages of chick embryo 24 Hrs, 48 Hrs and 72 Hrs
CO4.	Familiarize with the Qualitative test for proteins, lipids and carbohydrates
CO5.	Familiarize with the data analysis.and representation methods used in statistics

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	9	9	3	3	9	9
CO2	3	9	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	9	3	9	9	9	3	3
CO5	9	9	9	3	3	9	9
Weightage	33	33	33	21	21	27	27
weighted percentage of course contribution of pos	4.3	4.5	5.3	3.2	3.7	4.1	4.5

Level of correlation between co's and po's

1-Low 3 – Medium 9- High 0 - No correlation

**Text books:**

1. P.S. Verma and V.K Agarwal: Genetics (S.Chand & Co)
2. B.I.Balinsky: An introduction to Embryology (Holt – Saunders international)
3. K.Vijayaraman , George john , P. Manikili, Uyiriyal, Iyarpiyal,Kaniniyin Payanpadugal. Uyiriyapulliyal (Chimera).



**SEMESTER - VI**  
**21UZ014**

**HOURS/ WEEK – 3**  
**CREDIT - 4**

**MAJOR PRACTICAL –IV**

**ANIMAL PHYSIOLOGY, MICRO BIOLOGY AND EVOLUTION**

**ANIMAL PHYSIOLOGY:**

1. Dissolved O<sub>2</sub> consumption by fish
2. Qualitative test for ammonia, urea and uric acid
3. Enumeration of RBC and WBC by Haemocytometer
4. Model: 1. Haemoglobinometer 2. Sphygmomanometer 3. Kymograph 4. Stethoscope
5. Electro cardiogram

**1. MICROBIOLOGY:**

1. Serial dilution technique
2. Preparation of culture media and methods of sterilisation
3. Enumeration of bacteria from water samples
4. Identification of Gram Positive and Gram Negative bacteria. (Gram staining)
5. Model: a) Autoclave b) Petriplate c) Inoculation loop d) Laminar flow chamber, e) Hot air oven

**EVOLUTION:**

1. Animals of evolutionary significance: 1. Preipatus 2. Archaeopteryx 3. Sphenodon
2. Homologous organ: Fore limbs of Frog and Pigeon
3. Analogous organ: Wings of insects and Birds
4. Coloration: 1. Chameleon, 2. Viper 3. Lycodon
5. Mimicry: a) Leaf insect and Stick insect  
b) Viceroy and monarch butterfly
6. Fossils: 1. Trilobite 2. Nautilus 3. Ammonite

**Compulsory study tour:**

1. A compulsory study tour to visit zoologically important place such as sea – shore, sanctuary, forest area, aqua culture farm etc., to observe and study the animals in their natural habitat.
2. The students should write an illustrated study tour report and the same is to be submitted for evaluation at the time of practical Examination

**COURSE OUT COMES**

CO Number	CO Statement
CO1.	Familiarize with the Qualitative test for ammonia, urea and uric acid
CO2.	Evaluate The mechanisms involved in Enumeration of RBC andWBC
CO3.	Evaluate and Familiarize with the Preparation of culture media and methods of sterilisation
CO4.	Analysis and Observation of of Gram Positive and Gram Negative bacteria.by -Gram staining
CO5.	Familiarize with the Animals of evolutionary significance, Homologous and Analogous organs, Coloration, Mimicry and Fossils

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	9	3	3	1	3	1
CO2	3	3	3	3	3	3	9
CO3	3	3	9	3	3	9	3
CO4	3	3	1	9	9	3	3
CO5	3	9	3	3	3	3	3
Weightage	15	27	19	21	19	21	19
weighted percentage of course contribution of pos	1.9	3.7	3	3.2	3.4	3.2	3.2

Level of correlation between co's and po's

1-Low 3 – Medium 9- High 0 - No correlation

**TEXT BOOKS:**

K.Vijayaraman and K.Palanivel; Cheymurai Vilangial; Acomplete book (Chimera

**SEMESTER - VI**  
**21UZOE2A**

**HOURS/ WEEK –5**  
**CREDIT - 5**

## **MICRO BIOLOGY**

### **Objectives:**

These papers instruct the students the History and Scope of microbiology, Microbial Technology, Microorganisms and Environment, food microbiology, microbial diseases and treatment.

### **UNIT –I**

Introduction concept and Scope of microbiology: classification of microbes, General structure of Microbes (Bacteria, Virus & Yeast)

### **UNIT –II,**

Staining techniques –simple and gram staining .Culture medium – Types – Measurement of bacterial growth, Microbial nutrition and its types.

### **UNIT-III**

Food microbiology: micro organisms of food , spoilage and food poisoning, methods of food preservation- Single cell protein (SCP) - Spirullina cultivation.

### **UNIT-IV**

Soil Microbiology – Soil microbes –Nitrogen fixation :Rhizobium–Bio fertilizer Azospirillum, Rhizobium. Agricultural microbiology: Micro organism of soil Humus –Mass culture of Nostoc . Micro organism in of soil formation Biopesticides.

### **UNIT –V**

Microbial diseases in man

- a) **Bacterial disease:** Tuberculosis.Cholera,Salmonellosis
- b) **Viral disease:** Poliomyelitis, Rabies, Chicken pox, Hepatitis and COVID (Corana virus.)

## COURSE OUTCOME

<b>CO 1</b>	classify the microbes and understand the structure and characteristic features of bacteria and other microbes
<b>CO 2</b>	understand and analyze the growth, factors affecting growth, growth characteristics and requirements of bacteria and Identification of microbes
<b>CO 3</b>	understand and apply the physical and chemical control measure, explains mode of action of antibiotics and lists the microbial diseases in farm animals and humans
<b>CO 4</b>	understand and apply role of microbes in food and industries
<b>CO 5</b>	understand and apply the beneficial role of microbes in biotechnology

### Mapping course outcomes with Programme outcomes

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	3	3	3	1	3	3
CO2	3	3	3	3	3	9	9
CO3	9	9	3	9	3	3	3
CO4	3	3	9	3	9	3	3
CO5	3	9	9	3	3	3	3
<b>Weightage</b>	<b>21</b>	<b>27</b>	<b>27</b>	<b>21</b>	<b>19</b>	<b>21</b>	<b>21</b>
<b>weighted percentage of course contribution of pos</b>	<b>2.7</b>	<b>3.7</b>	<b>4.3</b>	<b>3.2</b>	<b>3.4</b>	<b>3.2</b>	<b>3.5</b>

### Level of correlation between co's and po's

1-Low    3 – Medium    9- High    0 - No correlation

**TEXT BOOKS:**

1. C.B. Power and H .F.Daginawala: General Microbiology – Vol. I & II (Himalaya Publishing)

**REFERENCES**

1. M.j. Peleczar and R.D.Reid, Microbiology (Mc Graw Hill).
2. W.C.Frazier and D.C.West Goff: Food Microbiology.3.
3. H. Evans: Introductory Microbiology (cambrige Univer – press).
4. H.G. Schlegal: General Microbiology (cambrige Univer – press).

**SEMESTER - VI**  
**21UZOE2B**

**HOURS/ WEEK – 5**  
**CREDIT - 5**

## **MOLECULAR BIOLOGY**

### **Objectives:**

This course facilitates to understand the structure at molecular level and function of prokaryote and eukaryote cell. To enlighten our students about the structures and functions of cellular organelles and nucleic acids.

### **UNIT- I**

Introduction: Cell Shape, Structure and size- diversity – cell theory; isolation and growth of cell. Chromosome structure and function; specialized chromosome. Organization of chromosomes, abnormalities; numerical and structural changes.

### **UNIT –II**

DNA as the Genetic Material – replication – prokaryotic and eukaryotic DNA replication, function and modifications- protein and enzyme involved in replication, structure. DNA damage-mechanism of repair – excision repair, recombinational repair genetic code- organization of coding sequence and repetitive sequence.

### **UNIT- III**

Transcription – structure of transcriptional unit – regulatory signal elements; promoter. Post transcriptional modification of RNA. Wobble hypothesis. Translation, ribosomes and tRNA mechanism and regulation of protein synthesis. Post translational modification of protein.

### **UNIT- IV**

Concept of gene – gene fine structure – cistron, muton and recon- exons and introns. Regulation in prokaryotes, type of gene regulation, operon concept- lac. Homologous recombination, crossing over, single point and two point.

### **UNIT- V**

Biology of Cancer – Oncogenes and tumor suppressor gene. Programmed cell death. Apoptosis, theories regarding tumor formation.

## COURSE OUTCOMES

CO 1	Get knowledge about cell organelles and their functions understand the structure of DNA, its denaturation and renaturation, transposable elements.
CO 2	Understand the various functions adapted inside the cells.,analyse the process of Cell cycle, DNA replication and DNA repair mechanisms
CO 3	understand the process of gene expression. Apply knowledge on molecular mechanisms of protein synthesis
CO 4	analyse the gene expression, control mechanisms and understand the concept of antisense RNA.
CO 5	understand membrane transport and analyze protein sorting and vesicular transport.

### Mapping course outcomes with Programme outcomes

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	9	3	3	1	9	9
CO2	3	3	3	9	3	3	3
CO3	3	3	1	3	3	3	3
CO4	9	3	9	3	9	9	3
CO5	3	9	3	3	1	3	9
Weightage	27	27	19	21	17	27	27
weighted percentage of course contribution of pos	3.5	3.7	3	3.2	3	4.1	4.5

Level of correlation between co's and po's

1-Low 3 – Medium 9- High 0 - No correlation

### TEXT BOOKS:

1. James.D.Watson, Molecular biology Publication

### REFERENCES:

1. Essential of molecular biology, Freifelder D. (2003). Jones and Bartlet publishing.
2. Genes, Lewin B., 2007. Jones and Bartlet publishing.

**SEMESTER - VI**  
**21UZOE2C**

**HOURS/ WEEK – 5**  
**CREDIT - 5**

## **COMMUNICABLE DISEASES**

### **OBJECTIVES**

- To understand the air borne diseases
- To understand the food and water borne diseases CEO3. To understand the insect borne diseases
- To understand the sexually transmitted diseases CEO5. To understand the viral diseases

### **UNIT – I**

Microbial diseases: Measles, Mumps, Small pox, Tuberculosis, Pneumonia, Diphtheria, Meningitis – Symptoms, Prophylaxis and Control measures.

### **UNIT – II**

Food and water borne diseases: Cholera, Botulism, Typhoid, Amoebiasis, Tetanus - Symptoms, Prophylaxis and Control measures.

### **UNIT – III**

Insect borne diseases: Yellow fever, Dengue fever, Malaria, Elephantiasis, Sleeping sickness - Symptoms, Prophylaxis and Control measures.

### **UNIT – IV**

Sexually transmitted diseases: Gonorrhoea, Vaginitis, Syphilis, Chlamydia, Trichomoniasis - Symptoms, Prophylaxis and Control measures.

### **UNIT – V**

Viral hepatitis, Influenza, Polio, Rabies; Cold sores and AIDS - Symptoms, Prophylaxis and Control measures.



## COURSE OUTCOMES

CO 1	Familiar with air borne diseases and their preventive measures
CO 2	Familiar with food and water borne diseases and their preventive measures
CO 3	Understand and Familiarize the process of . insect borne diseases and their preventive measures
CO 4	Analyst and familiarize with the sexually transmitted diseases and their preventive measures.
CO 5	Analyse and familiarize with the viral diseases and their preventive measures.

### Mapping course outcomes with Programme outcomes

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	3	3	3	9	9	9
CO2	3	9	3	3	3	3	1
CO3	3	3	9	9	3	9	3
CO4	9	3	9	3	9	3	9
CO5	3	9	9	9	3	9	3
Weightage	27	27	33	27	27	33	25
weighted percentage of course contribution of pos	3.5	3.7	5.3	4.2	4.8	5.0	4.2

### Level of correlation between co's and po's

1-Low    3 – Medium    9- High    0 - No correlation

### TEXT BOOKS :

1.Mani. A. Narayanan, L.M. Selvaraj A.M. and Arumugam, N. 1996. Microbiology. Saras Publications.

### REFERENCE BOOKS:

1. M.J. Pelezar and R.D. Reid. 1993. Microbiology, McGraw Hill Pub.

**SEMESTER - VI**  
**21UZOE3A**

**HOURS/ WEEK – 4**  
**CREDIT - 4**

## **VERMICULTURE**

### **OBJECTIVES:**

- To provide the fundamental knowledge on Earthworms and its morphological characteristics.
- To enhance the knowledge on Vermicomposting and their role in sustainable agriculture.
- To understand the value of Vermitechnology and its significance.
- To gain knowledge about various cultural aspects of earthworm and the profitable production of vermicompost.

### **UNIT – I**

Earth worms – Historical aspects – outline classification – Biology of Earth worm( Type study of *Megascolia lumbrioides*) – classification – habit and habitat, External features, Digestive system ,and Nervous system Ecological classification – based on habitat as Epigeic, Endogeic ,and Anecic forms – classification based on behaviour-Humus feeders, humus formers - classification based on the food materials as Poly - humic, Meso-humic and Oligo- humic- classification based on the place of living as Night crawlers, Field worms, Manure worms, Palouse worms.

### **UNIT –II**

Physical, chemical and biological changes brought by earthworm in soil – burrows - drilosphere – earthworm casts.and its importance. Role of earthworm as biological controlling agent.

### **UNIT – III**

Vermiculture- need for vermiculture-steps involved in vermiculture-site selection, species selection, vermibed ,inoculation of earth worms Optimal conditions for vermiculture – temperature, moisture, pH, soil type, organic matter, protection from sunlight, rain- Predators – Enemies and Food preference

### **UNIT - IV**

Vermicomposting, requirements, steps involved in vermicomposting as site, containers, suitable species, selection of food, feeding and watering the vermibed. Vermiwash, Beneficial microbes in vermicomposting – and their advantages. Characteristics of vermicomposting – physical, chemical, biological, nutritive value, benefits and economic importance

**UNIT-V**

Methods of vermicomposting -pit method, heap method, bin or tray method, windrow method, and bed method .types of vermicomposting –monoculture and poly culture. Harvesting of vermicompost –storing and packing-Nutrients analysis –Marketing -. problems of vermicomposting and Cost benefit analysis.

**COURSE OUTCOMES**

CO1	Get knowledge on the importance of earthworms.
CO2	Understand the Vermicomposting methods in small and large scale
CO3	Analyze the significance of earthworms in sustainable agriculture.
CO4	Apply knowledge on entrepreneurship development of Vermiproducts.
CO5	Analyze problems of vermicomposting and Evaluate Cost benefit analysis

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	3	9	3	9	9	3
CO2	3	9	3	3	3	3	3
CO3	3	3	3	9	3	9	3
CO4	3	3	9	3	3	3	9
CO5	3	3	3	9	3	3	3
<b>Weightage</b>	<b>15</b>	<b>21</b>	<b>27</b>	<b>27</b>	<b>21</b>	<b>27</b>	<b>21</b>
<b>weighted percentage of course contribution of pos</b>	<b>1.9</b>	<b>2.9</b>	<b>4.3</b>	<b>4.2</b>	<b>3.7</b>	<b>4.1</b>	<b>3.5</b>

**Level of correlation between co's and po's**

**1-Low    3 – Medium    9- High    0 - No correlation**

**TEXT BOOKS:**

1. Edward, C.A., and P.J. Bohlen, 1996. Ecology of Earthworm 3rd edn. Chapman and hall.

**REFERENCES:**

1. Ismail, S.A., 1970 Vermiculture. The biology of Earthworm. Orient Logman, London.
2. Lee, K.E., 1985. Earthworm. Their ecology and relationship with soil and land use. Academic press. Sydney.

**SEMESTER - VI**  
**21UZOE3B**

**HOURS/ WEEK – 4**  
**CREDIT - 4**

## **ORNAMENTAL FISH CULTURE AND MANGEMENT**

### **OBJECTIVES**

- To study ornamental fishes in world wide
- To study the techniques of ornamental fish culture for employment opportunities
- To know about the viable marketing strategies in India and international level
- Provides information about the cultural and economic aspects of various ornamental fishes.

### **UNIT -I**

Importance and scope of Ornamental fish culture: Commercial value and its potential, trends in ornamental fish farming in the world and in India. Important freshwater and marine ornamental fish- (Gold fish, black molly, Koi fish, guppies, clown fish, butter fly fish).

### **UNIT- II**

Indroductio to aquarium and aquarium accessories. Aquarium design, Construction and preparation: size, shape, substrate, ornamental aquatic plants. Construction and functions of Biofilters: aerators – accessories for fish tanks – hood and lighting, nets, maintenance of water quality: controlling ammonia build up, pH, feeding regimes.

### **UNIT -III**

Popular ornamental fishes: Indian market and international market – freshwater species and marine species- basics on biology, habitat aquarium compatibility and patterns of reproduction.

### **UNIT -IV**

Brood stock management, Transportation of Brood fish. live and preparation and egg layers- carp, fighter fish and clown fish (marine), induced breeding – food and feeding – live feeds: rotifers, tubifex and artificial feeds.

### **UNIT- V**

Diseases management: Parasitic infection in ornamental fishes ( protozoan and crustacean infections). Common bacterial, viral, fungal Diseases and Their treatment and control. Transporation of ornamental fishes.

## COURSE OUTCOMES

CO1	Get field knowledge for design and construction of aquarium.
CO2	Understand the formulation of feed and nutrition management for betterment of ornamental fish culture
CO3	Apply knowledge on health management for successful production of aquarium fishes.
CO4	Analyze the breeding and culture techniques for the trading.
CO5	Analyze the Diseases management of Ornamental fish culture and viable marketing strategies in India and international level

### Mapping course outcomes with Programme outcomes

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	3	3	3	3	3	9	9
CO2	3	3	3	3	3	3	1
CO3	3	3	3	3	3	3	3
CO4	9	3	3	3	3	3	3
CO5	3	9	3	9	3	9	3
<b>Weightage</b>	<b>21</b>	<b>21</b>	<b>15</b>	<b>21</b>	<b>15</b>	<b>27</b>	<b>19</b>
<b>weighted percentage of course contribution of pos</b>	<b>2.7</b>	<b>2.9</b>	<b>2.4</b>	<b>3.2</b>	<b>2.6</b>	<b>4.1</b>	<b>3.2</b>

### Level of correlation between co's and po's

1-Low    3 – Medium    9- High    0 - No correlation

### REFERENCES:

1. Fish and fisheries India by Jhingram V.G. Hindustan Pub. Corporation – New Delhi.
2. Hand book of fresh water fishes of India by Beaver C.P – Narenda Pub. Home.
3. Santahnam *et al.*, A Manual of Freshwater Aquaculture.

**SEMESTER - VI**  
**21UZOE3C**

**HOURS/ WEEK – 4**  
**CREDIT - 4**

## **BIODIVERSITY CONSERVATION**

### **UNIT I**

#### **BIODIVERSITY:**

Definition, Convention on Biological Diversity; Characterization of Biodiversity: Species Diversity, Genetic Diversity and Ecosystem Diversity. Measurement of Biodiversity: Measurement of Genetic Diversity, Phenetic diversity, Allelic diversity and Sequence variation. Magnitude and Distribution: Ecosystems and habitats -hotspots in India.

### **UNIT II**

#### **LOSS OF BIODIVERSITY:**

Forest Degradation-Human influences on Biodiversity-illicit removal of timber, fuel, fodder, Shifting cultivation, Poaching, Grazing, Fire, Developmental activities-Urbanization, Fragmentation-Habitat loss, Diseases: Plant parasites, insects and fungi, Abiotic: Fire -Flood-Cyclone, acid rain - Pollution of soil, water and atmosphere. Status of Species: Extinction-Endemic Endangered-Vulnerable. Rare- threatened-Red Data Book.

### **UNIT III**

#### **BIODIVERSITY VALUES:**

Use or active values: Direct values –Food-Medicines-fuel–fodder, fishery, agriculture. Indirect Values: Environmental process-Carbon fixation, pollination, Gene flow, Water cycle, Nutrient cycle, Absorbing and decomposing the pollutants. Ecological services: protecting watershed, Soil formation and protection from erosion, regulating climate. Non-Use or Passive value: Vicarious use value-Bequest, Existence value, Ethical Value and Option Value.

### **UNIT IV**

#### **BIODIVERSITY CONSERVATION:**

In situ: National parks, Sanctuaries, Nature reserves. Biosphere reserves -Reserved and protected areas– Keystone species project-Sample plots-Preservation plots. Ex situ: Botanical Gardens, Zoos, Aquaria, Gene Banks. Ex situ techniques: Conservation through joint forest management, Biotechnology for Biodiversity Conservation.

**UNIT V ACTS:**

Legal Acts and Policies: Environment (Protection) Act 1986. Indian Forest Act 1927, Wildlife (Protection) Act 1972, Forest (Conservation) Act 1980, Biological Conservation Act 2002, Air (Prevention and Control of Pollution) Act 1981, Water (prevention and Control of Pollution) Act 1974. Public Interest Litigation (PIL) implementing Environmental Acts. Role of people and NGO for Biodiversity conservation.

**Course out comes**

CO1	Get knowledge on the importance of Biological Diversity. Genetic Diversity and Ecosystem Diversity
CO2	Understand the importance of loss of biodiversity
CO3	Understand the importance of biodiversity values.
CO4	Evaluate and Apply knowledge on biodiversity Conservation
CO5	Understand the importance of Legal Acts and Policies

**Mapping course outcomes with Programme outcomes**

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO1	9	9	3	3	3	3	3
CO2	9	3	3	9	3	3	9
CO3	3	3	1	3	3	1	3
CO4	3	9	3	9	3	9	3
CO5	3	9	3	3	3	3	3
<b>Weightage</b>	<b>27</b>	<b>33</b>	<b>13</b>	<b>27</b>	<b>15</b>	<b>19</b>	<b>21</b>
<b>weighted percentage of course contribution of pos</b>	<b>3.5</b>	<b>4.5</b>	<b>2.1</b>	<b>4.2</b>	<b>2.6</b>	<b>2.9</b>	<b>3.5</b>

Level of correlation between co's and po's

1-Low 3 – Medium 9- High 0 - No correlation



**TEXT BOOKS:**

1.Khan, T.I and Shishodia, Y.S., Biodiversity conservation and Sustainable, Development Pointer publications, Jaipur, 302003. (India)

2.Pandey, B.N., 2002. Eco-Degradation, Biodiversity and Health, Daya Publishing House, Delhi, 110035.

**REFERENCE BOOK:**

1. Dr.Raju, R.A., 1997. Forest Wealth of India, Daya Publishing House, Delhi, 110035

SEMESTER - VI  
21UGS

HOURS/ WEEK – 1  
CREDIT - 1

**GENDER STUDIES**

**OBJECTIVES:**

1. To make the Students to have clear understanding about Gender Equality and basic human rights.
2. To prepare them to fight against sexual harassment and realise their social responsibilities.

**UNIT – I**

**Concept of Gender:** Sex- Gender- biological determinism- Patriarchy- Feminism- Gender -Discrimination- Gender division of labour – Gender Stereotyping – Gender sensitivity- Gender Equity- Gender mainstreaming- Empowerment.

**UNIT- II**

**Women's Studies Vs Gender Studies:** UGC s Guidelines- VII to XI – Plans- Gender studies: Beijing conference and CEDAW – Exclusiveness and Inclusiveness.

**UNIT- III**

**Areas of Gender Discrimination:** Family – Sex ratio- Literacy- Health- Governance- Religion- work Vs Employment- Market- Media- Politics Law- Domestic Violence- Sexual Harassment –State Policies and Planning.

**UNIT IV**

**Women Development and Gender Employment:** Initiatives - International Women's Decade- International Women's Year- National Policy for Employment of women – Women Empowerment year 2001- Mainstreaming Global Policies.

**UNIT-V**

**Women movement and Safeguarding Mechanism:** In India National/ State Commission for women (NCW) – All women Police Station- Family Court- Domestic Violence act – Prevention of Sexual Harassment at work place- Supreme Court Guidelines – Maternity Benefit Act- PNDT Act Hindu succession Act 2005- Eve Teasing Prevention Act- Self Help Groups- 73<sup>rd</sup> and 74<sup>th</sup> Amendment for PRIS.

**REFERENCES:**

1. Bhasin Kamala, Understanding Gender: Gender Basics, New Delhi: Women Unlimited, 2004.
2. Rajadurai. S.V, Geetha, V.Themed in Caste Gender and Religion, Tiruchirappalli, Bharathidasan University, 2007.
3. Dr. C.Sethuraman- Gender Studies – New Century Book House.

**SEMESTER - VI**  
**21UZOV1**

**HOURS/ WEEK – 1**  
**CREDIT - 1**

## **AQUARIUM FISH KEEPING**

(VALUE ADDED COURSE - I)

### **OBJECTIVES**

- To study ornamental fishes in world wide.
- To study the techniques of ornamental fish culture for employment opportunities.
- To know about the viable marketing strategies in India and international level Provides information about the cultural and economic aspects of various ornamental fishes.

### **UNIT –I**

#### **SCOPE AND POTENTIAL OF AQUARIUM FISHES**

Importance and scope of aquarium, Commercial value and its potential of fresh water fishes (gold fish, black molly, angel fish and guppies) –Basis on biology.

### **UNIT- II**

#### **BREEDING, FEEDING AND TRANSPORTING**

Patterns of reproduction, preparation of breeding, breeding behavior, induced breeding, food and feeding- artificial and live feed. Fish handling – packing forwarding techniques.

### **UNIT – III**

#### **CONSTRUCTION OF AQUARIUM AND DISEASES MANAGEMENT**

Design, construction and preparation of aquarium – Aquarium accessories and equipments – common ornamental fish diseases (bacteria, fungal and protozoan) – Treatment and control.

### COURSE OUTCOMES

CO1	Understand the formulation of feed and nutrition management for betterment of ornamental fish culture.
CO2	Analyze the breeding and culture techniques for the trading.
CO3	Get field knowledge for design and construction of aquarium.

### REFERENCES:

1. Fish and fisheries India by Jhingram V.G. Hindustan Pub. Corporation – New Delhi.
2. Hand book of fresh water fishes of India by Beaver C.P – Narenda Pub. Home.
3. Santahnam *et al.*, A Manual of Freshwater Aquaculture.

**SEMESTER - VI**  
**21UZOV2**

**HOURS/ WEEK – 1**  
**CREDIT - 1**

## **MEDICAL LAB TECHNOLOGY**

(VALUE ADDED COURSE – II)

### **OBJECTIVES**

Collect and prepare human samples for analysis.

- Operate and calibrate clinical laboratory instruments, recognize and correct basic instrument malfunctions
- Understand the technical and procedural aspects of laboratory testing for gastric juice, urine and faecal matter and perform various staining techniques for bacterial pathogens.
- Interpret body fluid tests, detect abnormalities, assign a diagnosis.

### **UNIT-I**

#### **USE OF LABORATORY INSTRUMENTS**

Principles, use and maintenance of laboratory instruments - Autoclave, hot air oven, incubators, water bath, centrifuge, refrigerator, colorimeter, pH meter, haemoglobinometer, haemocytometer, microtomes and balances.

### **UNIT-II**

#### **BLOOD SAMPLING AND DIAGNOSIS AND BLOOD PRESSURE APPARATUS**

Blood-collection of blood samples, analysis of blood and basic hematological techniques blood and cell morphology, RBC, WBC total counts and differential counts. sphygmomanometer and respirometer.

### **UNIT-III**

#### **URINE SAMPLING ANALYSIS AND LABORATORY MANAGEMENT**

Urine: analysis of urine samples; chemical parameters routinely required to be analyzed. Pregnancy tests. Analysis of faeces and semen. Laboratory management and safety. Safe disposal of hospital wastes.

### Course outcome

CO Number	CO Statement
CO1	Understand fundamental analytical principles and processes used in clinical laboratory testing for gastric juice, urine and faecal matter. Understand the concepts and safety measures of clinical laboratory instruments.
CO2	Acquired technical skills will help the students for collecting and processing biological specimens for analysis.
CO3	Application of medical laboratory procedures will enable the students to distinguish normal and abnormal microscopic pathogens.
CO4	Students enable their critical and analytical thinking in the detection of diseases.
CO5	Interpretation will empower students to compare and contrast clinical laboratory procedures, interpret data and predict diagnosis.

### REFERENCES

1. Sood Ramnic, 1985. Medical laboratory Technology, Jaypee brothers, New Delhi King, Maurice, 1976. a medical laboratory for developing countries, Oxford university press, ELBS Edition, Madras.
2. Samuel, K.M., Notes on clinical laboratory techniques, M.K.G. Iyer and sons Madras