Vellalar College for Women (Autonomous), Erode - 12.

Bachelor of Science in Zoology

2018 – 19 and onwards

Course Content and Scheme of Examinations (CBCS & OBE Pattern)

Semester I

Part	Study Components	Subject Code	Title of the Paper	Inst. Hrs./	Exam . Dur. Hrs.	Max. Marks			Credits
						CIA	ESE	Total	
I	**Language I**	18TAMU101/ 18HINU101	Tamil / Hindi Paper I	6	3	25	75	100	3
II	**Language II**	18ENLU101	English Paper I	6	3	25	75	100	3
III	**Core**	18ZOUC101	Invertebrata I	3	3	25	75	100	4
		18ZOUC102	Invertebrata II	3	3	25	75	100	4
		18ZOUCP01	Practical I	3	-	-	-	-	-
	Allied - I	18BOUA101	Botany Paper I	4	3	20	55	75	4
		18BOUAP01	Botany Practical	3	-	-	-	-	-
IV	**Foundation Course**	18FOCUIES	Environmental Studies	2	3	-	100	100	2
							Total	**575**	**20**

Semester II

I	**Language I**	18TAMU202/ 18 HINU202	Tamil / Hindi Paper II	6	3	25	75	100	3
II	**Language II**	18ENLU202	English Paper II	6	3	25	75	100	3
III	**Core**	18ZOUC203	Chordata	6	3	25	75	100	4
		18ZOUCP01	Practical I	3	3	40	60	100	4
	Allied I	18BOUA202	Botany Paper II	4	3	20	55	75	4
		18BOUAP01	Botany Practical	3	3	20	30	50	2
IV	**Value Education**	18VEDU2HR	Value Education and Human Rights	2	3	-	100	100	2
							Total	**625**	**22**

Semester III

Part	Study Components	Subject Code	Title of the Paper	Inst. Hrs./	Exam. Dur. Hrs.	Max. Marks			Credits
						CIA	ESE	Total	
I	Language I	18TAMU303/ 18HINU303	Tamil / Hindi Paper III	6	3	25	75	100	3
II	Language II	18ENLU303	English Paper III	6	3	25	75	100	3

III	Core	18ZOUC304	Developmental Biology & Evolution	4	3	25	75	100	4
		18ZOUCP02	Practical II Based on C_4 & C_5	2	-	-	-	-	-
	Allied II	18CHUA001	Chemistry Paper I	4	3	20	55	75	4
		18CHUAP01	Chemistry Practical Based on Paper I & II	3	-	-	-	-	-
IV	Skill Based Subject I			3	3	25	75	100	3
	Basic Tamil	-	-	2	-	100	-	100	2
	Advanced Tamil				3	25	75		
	Non - Major Elective I				3	-	100		
							Total	**575**	**19**
Semester IV									
I	Language I	18TAMU404/ 18HINU404	Tamil / Hindi Paper IV	6	3	25	75	100	3
II	Language II	18ENLU404	English Paper IV	6	3	25	75	100	3
III	Core	18ZOUC405	Environmental Biology & Animal Behaviour	4	3	25	75	100	4
		18ZOUCP02	Practical II Based on C_4 & C_5	2	3	40	60	100	4
	Allied II	18CHUA002	Chemistry Paper II	4	3	20	55	75	4
		18CHUAP01	Chemistry Practical Based on Paper I & II	3	3	20	30	50	2
IV	Skill Based Subject II	18ZOUS402	Multi Skill Development Paper	3	1*	40	60*	100	3
	Basic Tamil	-	-	2	-	100	-	100	2
	Advanced Tamil				3	25	75		
	Non - Major Elective I				3	-	100		
							Total	**725**	**25**
* Online Examination									

Semester V									
Part	**Study Components**	**Subject Code**	**Title of the Paper**	**Inst. Hrs./**	**Exam. Dur. Hrs.**	**Max. Marks**			**Credits**
						CIA	**ESE**	**Total**	
III	Core	08ZOUC506	Cell Molecular Biology & Genetics	5	3	25	75	100	4
		08ZOUC507	Microbiology & Immunology	5	3	25	75	100	4
		09ZOUC508	Biostatistics, Bioinformatics & Computer Applications	4	3	25	75	100	4
		10ZOUC509	Human Genetics & Counselling	4	3	25	75	100	4
		14ZOUCP03	Practical III Based on $C_{6,}$ $C_{7,}$ $C_{8,}$ & C_{9}	2	-	-	-	-	-
		14ZOUCP04	Practical IV Based on C10, C11 & C12	3	3	-	-	-	-
	Elective	16ZOUE501	Medical Laboratory Technology Paper- I	4	3	25	75	100	4
		16ZOUEP01	Elective Practical Based on Elective I &	2	-	-	-	-	-
IV	Skill Based Subject III			3	3	25	75	100	3
							Total	**600**	**23**
Semester VI									
		14ZOUC610	Biophysics, Biochemistry and Bioinstrumentation	4	3	25	75	100	4
III	Core	14ZOUC611	Physiology & Endocrinology	6	3	25	75	100	4
		14ZOUC612	Biotechnology	6	3	25	75	100	4
		14ZOUCP03	Practical III Based on $C_{6,}$ $C_{7,}$ $C_{8,}$ & C_{9}	2	3	40	60	100	4
		14ZOUCP04	Practical IV Based on C10, C11&C12	3	3	40	60	100	4
	Elective	16ZOUE602	Medical Laboratory Technology Paper- II	4	3	25	75	100	4

	Elective	16ZOUEP01	Elective Practical Based on Elective I &	2	3	40	60	100	3
IV	Skill Based Subject IV			3	3	25	75	100	3
V	Extension Activity	-	NCC / NSS / Physical Education /YRC/Green Society/CCC/EDP	-	-	-	-	100	1
							Total	**900**	**31**
Total I - VI Semester								**4000**	**140**

SKILL BASED SUBJECTS

S.NO	Subject Code	Semester	Title of the	
1.	18ZOUS301	III	Ornamental Fish Culture	Cafeteria
2.	18ZOUS402	IV	Multi skill Development Paper	-
3.	16ZOUS503	V	Animal Farming	Cafeteria
4.	11ZOUS604	VI	Sericulture	Cafeteria

NON - MAJOR ELECTIVES

S.NO	Subject Code	Title of the paper		
1.	17TMLU301/ 17TMLU402	*Basic Tamil		
2.	17ADTU301/ 17ADTU402	** Advanced Tamil		
3.	18ZOUN301/ 18ZOUN402	Non Major Elective	Wild Life Diversity and Conservation / Public Health and Hygiene	

**For students where part- I in secondary education is not Tamil

*For students where part I in Higher secondary education is not Tamil

SELF LEARNING PAPER (OPTIONAL)

S.NO	Subject Code	Title of the paper	Exam. Dur. Hrs	Max. Marks	Credits	

1.	13ZOUSL04	Apiculture	3	100	5	
2.	13AUGSL05	General Awareness	3	100	5	

Allied Zoology (For Botany Students)

S.No	Subject code	Title of the paper	Exam Dur .Hrs	Max. Marks	Credits
1	18ZOUA101	Invertebrata and Chordata	3	75	4
2	18ZOUA202	Applied Zoology	3	75	4
3	18ZOUAP01	Allied Zoology Practical	3	50	4

VELLALAR COLLEGE FOR WOMEN (AUTONOMOUS), ERODE-12

DEPARMENT OF ZOOLOGY AND DEPARTMENT OF PHYSICS

UGC Sponsored Career Oriented Programme

Course Content - Scheme of Examination

Certificate/Diploma/Advanced Diploma Course

(For the students admitted during the academic year 2013-2014 and onwards)

BIOMEDICAL INSTRUMENTATION

S.No	Course	Subject Code	Study Component	Course Title	Inst. Hours / week	Examination			
						CIA	Ext. Exam	Total	Credit
1	Certificate (I Year)	08ABI21	Paper - I	Biomedical Instrumentation -I	100	25	75	100	6
		13ABI22	Paper - II	Pathology and Clinical Laboratory Technology	100	25	75	100	6
		13ABI2P	Practical - I		60	40	60	100	5
		08ABI2T	In House/ Industrial Training		40	-	-	100	3
2	Diploma (II Year)	08ABI23	Paper - III	Radiology	100	25	75	100	6
		13ABI44	Part - IV	Medical Microbiology and Biochemistry	100	25	75	100	6
		13ABI4P	Practical - II		60	40	60	100	4
		08AB14V	Project/Viva voce		40	-	-	100	4
3	Advanced Diploma (III Year)	08ABI65	Paper- V	Biomedical Instrumentation -II	90	25	75	100	6
		08ABI66	Paper- VI	Hospital and Pharmaceutical Managment	90	25	75	100	6
		08ABI6P	Paper - III		75	40	60	100	4
		08ABI6V	Project/Viva voce		45	-	-	100	4

SEMESTER I

CODE	COURSE TITLE
18ZOUC101	**INVERTEBRATA- I**

Category	CIA	ESE	L	T	P	Credit
Core	25	75	42	3	-	4

Preamble

An introduction to the basic aspects of classification, structural and functional details of Invertebrates and to understand the diversity, evolution and relationship between the major groups of Invertebrates.

Course Outcomes

On the successful completion of the course, students will be able to understand and analyze the structural and functional organization of Invertebrate animals.

CO Number	CO Statement	Knowledge Level
CO1	To learn and recollect the organizational, anatomical and functional aspects of Invertebrates.	K1
CO2	To understand the physiological processes those are significant to each phylum.	K2
CO3	To analyze anatomical and functional modifications that exists in different forms of Invertebrates.	K2
CO4	To compare and evaluate the Invertebrate organization with reference to their life history and development.	K2, K3
CO5	To discuss and interpret the economic importance of Invertebrate animals based on their habit and habitats.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	M	M	S
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	M	S	S	M	S

S- Strong; M-Medium

Syllabus

UNIT I **9Hrs.**

Phylum Protozoa : Classification upto orders and their distinguishing characters with suitable examples.

Type study : **Paramecium caudatum** - External features - Nutrition Locomotion - Reproduction Asexual - Binary fission, Sexual reproduction - Conjugation, Autogamy, Endomixis, Hemimixis and Cytogamy.

General topic : Protozoan human diseases.

UNIT II **8 Hrs.**

Phylum Porifera : Classification upto orders and their distinguishing characters with suitable examples.

Type study : **Leucosolenia botryoides** (Ascon sponge) - External features- Body wall - Spicules - Canal system - Nutrition - Reproduction

General topic : Canal system in sponges.

UNIT III **9 Hrs.**

Phylum Coelenterata: Classification upto orders and their distinguishing characters with suitable examples.

Type study : **Obelia geniculata** - External features- Histology of the colony- Cnidoblast and its functions- Nutrition- Reproduction - Life history.

General topic : Polymorphism in Coelenterates.

UNIT IV **9 Hrs.**

Phylum Helminthes : Classification upto orders and their distinguishing characters with suitable examples.

Type study : **Taenia solium** (Tape worm) - External features - Body wall - Feeding - Respiratory system - Excretory system - Nervous system - Reproductive system- Life cycle.

General topic : Parasitic adaptation in Helminthes.

UNIT V **10 Hrs.**

Phylum Annelida : Classification upto order level. Salient features - examples.

Type study : **Megascolex mauritii** (Earth worm) - External features - Body wall - Coelom - Locomotion - Digestive system - Circulatory system - Excretory system - Nervous system - Reproductive system.

General topic : A brief account on Vermiculture.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ekambaranath Ayyar and Anantha Krishnan T.N	A Manual of Zoology Vol I Part I & II	Viswanathan Publication	2003 Reprint

2.	Jordon E.L. and Verma P.S	Invertebrate Zoology	S.Chand & Co., New Delhi	2005 Reprint

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Kotpal. R.L	Modern text book of zoology:Invertebrates : animal diversity- I.	Rastogi Publication	2014 & 11th Edn
2.	Dhami and Dhami	Invertebrate Zoology	Chand & Co	2015
3.	Majpuria T.C	Invertebrata Zoology	Pradeep Publication	2001

Web Resources

- http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/I/Invertebrates.html
- https://www.britannica.com/animal/invertebrate
- https://study.com/academy/lesson/chordates-features-groups-characteristics.html

Pedagogy

- Lecture, PPT, Chart, Models, Specimen

CODE	COURSE TITLE					
18ZOUC102	INVERTEBRATA- II					
Category	**CIA**	**ESE**	**L**	**T**	**P**	**Credit**
Core	25	75	42	3	-	4

Preamble

An introduction to the basic aspects of classification, structural and functional details of Invertebrates and to understand the diversity, evolution and relationship between the major groups of Invertebrates.

Course Outcomes

On the successful completion of the course, students will be able to understand and analyze the structural and functional organization of Invertebrate animals.

CO Number	CO Statement	Knowledge Level
CO1	To learn and recollect the organizational, anatomical and functional aspects of Invertebrates.	K1
CO2	To understand the physiological processes those are significant to each phyla.	K2
CO3	To analyze anatomical and functional modifications that exists in different forms of Invertebrates.	K2
CO4	To compare and evaluate the Invertebrate organization with reference to their life history and development.	K2,K3
CO5	To discuss and interpret the economic importance of Invertebrate animals based on their habit and habitats.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	S	M	S
CO3	S	S	M	S	M
CO4	S	S	S	S	S
CO5	M	S	S	M	S

S- Strong; M-Medium

Syllabus

UNIT I **10 hrs**

Phylum Arthropoda : Classification up to orders and their distinguishing characters with suitable examples.

Type study : **Penaeus indicus** (Marine Prawn) - External features- Appendages – Body wall - Body cavity - Digestive system - Circulatory system - Respiratory system - Excretory system - Nervous system - Reproductive system - Life history.

UNIT II **8 hrs**

Type study : **Periplaneta americana** (Cockroach) - External features – Body wall- Body cavity - Mouth parts - Digestive system - Blood vascular system - Respiratory system - Excretory system - Nervous system - Reproductive system

General topic : Beneficial insects.

UNIT III **9 hrs**

Phylum Mollusca : Classification up to orders and their distinguishing characters with suitable examples.

Type study : **Pila globosa** (Apple snail) - Shell - Body organization- Digestive system - Respiratory system - Circulatory system - Excretory system - Nervous system - Sense organs - Reproductive system.

UNIT IV **8 hrs**

Type of study : **Sepia** (Cuttle fish) - External features - Colour change - Locomotion- Digestive system - Ink gland - Respiratory system - Circulatory system-Nervous system - Excretory system - Reproductive system.

General topic : Economic importance of Mollusca.

UNIT V **10 hrs**

Phylum Echinodermata : Classification up to orders and their distinguishing characters with suitable examples.

Type study : **Asterias rubens** (Star fish) - External features- Pedicellaria structure and function - Digestive system - Respiratory system - Water vascular system - Circulatory system- Excretory system - Reproductive system- Life cycle.

General topic : Larval forms of echinoderms and their evolutionary Significance.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ekambaranath Ayyar and Anantha Krishnan T.N	A Manual of Zoology Vol I Part I & II	Viswanathan Publication	2003 Reprint

2.	Jordon E.L. and Verma P.S	Invertebrate Zoology	S.Chand & Co., New Delhi	2005 Reprint

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Kotpal. R.L	A Modern text book of Zoology	Rastogi Publication	2009 & 4th Edn
2.	Dhami and Dhami	Invertebrate Zoology	Chand & Co	2015
3.	Majupuria T.C	Introduction of Invertebrates	S.Nagin & Co., Delhi	2001

Web Resources

- http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/I/Invertebrates.html
- https://www.britannica.com/animal/invertebrate

Pedagogy

- Lecture, PPT, Chart, Specimen

SEMESTER II

CODE	COURSE TITLE
18ZOUC203	CHORDATA

Category	CIA	ESE	L	T	P	Credit
Core	25	75	85	5	-	4

Preamble

An introduction to the basic concepts in Zoology with special emphasis on the systematic position, structure and physiological functions in Chordate animals.

Course Outcomes

On the successful completion of the course, students will be able to understand and analyze the diversity, organization and taxonomic status of Chordates.

CO Number	CO Statement	Knowledge Level
CO1	To identify with the systematics of phylum Chordata and its classes up to order level with morphological, anatomical and functional modifications in Vertebrates.	K1
CO2	To assess the general and specific characteristics in different classes of Chordates.	K2
CO3	To analyze and compare the adaptive changes that have occurred in different groups of Vertebrates based on their habitat.	K2
CO4	To envision and analyze the modifications in analogy and homology that occurred in various classes of Chordates.	K3
CO5	To interpret the evolutionary concepts and relationship of animals in the biological history.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	M	M	S
CO3	S	S	M	S	S
CO4	S	S	S	S	S
CO5	M	S	S	S	S

S- Strong; M-Medium

Syllabus

UNIT I **18 Hrs.**

Chordata : Classification and General characteristics

Prochordata : Classification and General characteristics

Type study : **Branchiostoma lanceolatum** (Amphioxus) - External features -Body wall – Atrium - Coelom - Notochord - Digestive system - Circulatory system - Excretory system - Nervous system - Reproductive system.

Class Pisces : Salient features-Classification up to orders with two suitable examples.

Type study : **Scoliodon sorrakowah** (Shark) - External features – Fins – Placoid scales - Digestive system - Respiratory system - Circulatory system - Nervous system- Sense organs - Urinogenital system.

General topic : Parental care in fishes.

UNIT II **18 Hrs.**

Class Amphibia : Salient features- classification up to orders with two suitable

Examples.

Type study : **Rana hexadactyla** (Frog) - External features - Sexual dimorphism - Skin - Chromatophores and Colour change - Coelom - Locomotion- Digestive system - Respiratory system - Circulatory system - Nervous system - Sense organs - Urinogenital system - Life cycle.

General topics : Neoteny.

UNIT III **18 Hrs.**

Class Reptilia : Salient features- classification up to orders with two suitable Examples.

Type study : **Calotes versicolor** (Garden Lizard) - External features- Body cavity- Digestive system- Respiratory system- Circulatory system- Nervous system- Sense organs- Excretory system- Reproductive system.

General topic : Poisonous snakes of South India.

UNIT IV **18 Hrs**.

Class Aves : Salient features - Classification up to orders with two suitable Examples.

Type study : **Columba livia** (Pigeon) External features - Exoskeleton -

Digestive system - Circulatory system- Respiratory system - Flight muscles and Mechanism of flight - Nervous system - Sense organs- Excretory system - Reproductive system.

General topic : Migration in birds.

UNIT:V **18 Hrs.**

Class Mammalia : Salient features- Classification up to orders with suitable two Examples.

Type study : **Oryctolagus cuniculus** (Rabbit) - External features - Integument - Coelom - Abdominal cavity - Digestive system - Circulatory system- Respiratory system- Nervous system- Sense organs- Urinogenital system.

General topic : Aquatic mammals.

Text Books

S. No.	Authors	Title of the Book	Publishers	Year and Edition
1.	Ekambaranath Ayyar and Anantha Krishnan T.N	A Manual of Zoology Vol II Part I & II	Viswanathan Publication	2003

Reference Books

S. No.	Authors	Title of the Book	Publishers	Year and Edition
1.	Majupuria T.C	Introduction of Chordates	S.Nagin & Co., Delhi, 6th Edition	2001
2.	Kotpal R.L.	Modern Text Book of Zoology Vertebrates	Rastogi Publication	2009 & 4th Edn
3.	Jordon E.L. and Verma P.S	Chordate Zoology	S.Chand & Co., New Delhi	2014 & 2th Edn

Web Resources

- https://www.britannica.com/animal/chordate
- https://study.com/academy/lesson/chordates-features-groups-characteristics.html
- https://a-z-animals.com/reference/animal-classification/

Pedagogy

- Lecture, PPT, Chart, Specimen, Seminar, Models

SEMESTER I & II

CODE	COURSE TITLE
18ZOUCP01	CORE PRACTICAL I

Category	CIA	ESE	L	T	P	Credit
Core	40	60	-	-	90	4

Preamble

To study the morphological as well as anatomical features of Invertebrates and Chordates. To impart practical skills in mounting and dissecting invertebrate animals. To collect and study insects belonging to different orders.

Course Outcomes

On the successful completion of the course, the students will have practical skills in culturing, observing and distinguishing taxonomic features of Invertebrate and Chordate animals.

CO Number	CO Statement	Knowledge Level
CO1	To understand and analyze the different systems of Invertebrates and Chordates through live and virtual dissections.	K2
CO2	To design methodology for culturing organisms. To compare and contrast the systematic position, biological significance, structure and function of organisms.	K2
CO3	To access and analyze the beak and feet modifications in birds. To sequence the stages of lifecycle of selected animals. To categorize and identify the insects based on their salient features, habit and habitats. To analyze and distinguish morphometics of different species of fishes.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S

S- Strong

Syllabus

LABORATORY EXERCISES:

1. **COCKROACH** - Digestive system, Nervous system, Male and Female Reproductive system (Live Dissection- Demonstration)
2. **FROG** - Digestive system, Arterial system, Venous system, Male and Female Urino genital system (Virtual Dissection)

MOUNTINGS:

3. **COCKROACH** - Mouth parts
4. **EARTHWORM** - Body setae

EXPERIMENTS:

5. Culturing and identification of Paramecium.
6. Observation – Butterfly Life cycle.
7. Identification and determination of morphometric characters of fresh water fishes. (Any three)
8. Study of metamorphosis in Frog
9. Observation of beak modification in birds.
10. Observation of feet modification in birds.
11. Identification of different types of feathers in a bird.

FIELD STUDY - Observation and identification of any 15 insects. Report must be submitted along with record note book.

SPOTTERS:

A.CLASSIFY GIVING REASONS:

Paramecium, Obelia, Taenia solium, Earthworm, Prawn, Starfish, Shark, Frog, Pigeon, Rabbit.

B.DRAW LABELLED SKETCH :

Obelia medusa, T.S of Earthworm, T.S. of Taenia solium, Frog- Skull (Dorsal view and ventral view), Pectoral and Pelvic girdle.

C. COMMENT ON BIOLOGICAL SIGNIFICANCE:

Sponge gemmule, Physalia, Peripatus, Axolotyl larva, Limulus, Chaemeleon.

D. RELATE STRUCTURE AND FUNCTION:

Spicules of Sponges, Scolex of Taenia, Parapodium of Nereis, Body setae of Earthworm, Mandible of Cockroach, Radula of Pila, Placoid scale, Quill feather.

E. WRITE DESCRIPTIVE NOTES:

Sea anemone, Lepas, Mysis larva, Bipinnaria Larva, Octopus, Hippocampus, Exocoetus, Rhacophorus, Cobra, Bat.

Pedagogy

- Demonstration, Field Study, Video Tutorials

SEMESTER-III

Core paper-IV

DEVELOPMENTAL BIOLOGY & EVOLUTION

Instrutional Hrs. : 60 **Sub.Code:09ZOUC304**

Max.Marks: CIA-25; ESE-75 **Credits: 4**

Objectives: 1. To understand the basic concepts in Embryology.

2. To know the diversity of animal life in earth and mechanism of their evolution.

UNIT I **12 Hrs**

Gametogenesis – Spermatogenesis – Oogenesis - *Fertilization.*

UNITII **12Hrs**

Types of eggs, patterns of cleavage, Blastulation and Gastrulation in Frog.

Morphogenetic movements, *Fate map.*

UNIT III **12 Hrs**

Development of eye and heart in frog. IVF (Basic concepts only). *Embryonic stem cells* (Basic concepts only). Placentation in mammals.

UNIT-IV **12 Hrs**

Concepts of Evolution, Origin of life, Fossils and Fossilization, *Dating of fossils*, Geological time scale.

UNIT-V **12 Hrs**

Speciation, *Polymorphism,* Isolation & Isolating mechanism, Evolution of man.

Note: *Italics* denotes topics for self study.

TEXT BOOKS

1**.Arumugam N.,** *A text book of Embryology* , Saras publication, Nager coil, 1974.

2.**Arumugam N.,** *Organic Evolution*,Saras publication,Nagercoil,2002.

REFERENCE BOOKS

1.**Balinsky B.L.,** *An Introduction to Embrology,* W.B. Saunders Company, Philadelphia & London,1970.

2. **Berril N.J.,** *Developmetal biology,* MC Grew Hill New York,1971.

3. **Verma P.S. and Agarwal V. K.,** *Concepts of Evolution,* S. Chand and Co., New Delhi.

.

SEMESTER- III
Skill Based Subject – I
ORNAMENTAL FISH CULTURE

Instructional Hrs: 45 **Sub.Code:16ZOUS301**
Max.Marks: CIA-25; ESE-75 **Credits: 3**

Objectives: To acquire basic knowledge of fish culture, in setting up, maintenance and management of different ornamental fishes.

Unit: I **6 Hrs**

Benefits of ornamental fish culture as a hobby. Requirements and steps involved in setting up an aquarium. Types of aquarium plants- Importance of aquarium plants. *Water quality management*.

Unit: II **6 Hrs**

Fresh water ornamental fishes- Gold fish- Fighter fish- Guppy – Molly- *Zebra fish*- koi carp- Platy- *Tiger barb*- Angel fish.

Unit: III **6 Hrs**

Food and Feeding- Nutritional requirements of fishes- Types of food- Live food- Artificial food. Live feed culture (Artemia, Infusorians and *Spirulina*) – Artificial feed preparation –Disadvantage of artificial feed.

Unit: IV **6Hrs**

Breeding of fishes- Breeding habits- Pre Spawning- Spawning- Live bearers- Egg layers- Care of eggs, young and spawns. *Transport of ornamental fishes*.

Unit: V **6 Hrs**

Ornamental fish diseases- Fin rot- Columnaris- White spot disease- Velvet disease- Gill rot- Fish louse- *Nutritional deficiency diseases*.

Note: Italics denotes topics for self study.

References:

1. Jhingran U.G., Fish and Fisheries in India. Hindustan Publication,1982.

2. Thara Devi.C.S and Jayashree K.V., Home Aquarium. Saras Publication, 2009.

3. Pandey.K and Shukla.J.P., Fish and Fisheries- 3rd Revised Edition, Rastogi Publications, 2012.

4. Arumugam.N., Aquaculture and Fisheries, Saras Publication, 2014.

5. Ranjit Daniels.R.J., Fresh water Fishes of Peninsular India, Universities Press, 2002.

SEMESTER - IV

Core paper - V

ENVIRONMENTAL BIOLOGY AND ANIMAL BEHAVIOUR

Instructional Hrs.:60 **Sub.Code : 08ZOUC405**

Max. Marks :CIA -25 ;ESE- 75 **Credits : 4**

Objectives : To understand the principles and application of experimental biology and understanding animal behaviour.

UNIT – I **12Hrs.**

Abiotic factors – Light and Temperature, Animal relationship – Mutualism, *Commensalism* and Parasitism.

UNIT – II **12Hrs.**

Population – Definition – Characteristics of population.

Community – Definition – Characteristics of Community – Ecotone and Edge effect – *Ecological Niche.*

UNIT – III **12Hrs.**

Terrestrial ecology - *Grassland Biome.* Desert Biome.

Freshwater ecology – Characteristics, classification and adaptations.

UNIT – IV **12Hrs.**

Marine ecology – Characteristics, classification and adaptations.

Estuarine habitat - *Characteristics,* classification and adaptations.

UNIT – V **12Hrs.**

Approaches to behaviour study – Classification of behaviour, *Social behaviour - Honeybees,* Chronobiology, Bioluminescence and its significance in animals.

Note:*Italics* denotes topics for self study.

TEXT BOOKS

1. **Arumugam N.,** *Concepts of Ecology,* Saras Publication, Nagarcoil, 2001.

2.**Veer Bala Rastogi** , *Animal Ecology & Distribution of Animals,* Kadarnath Ramnath, Delhi, 8th Edition.

REFERENCE BOOKS

1. **Kotpal R.L and Bali NP.,** *Concepts of Ecology,* Vishal Publications, Delhi.
2. **Odum E.P**., *Basic Ecology*, Saunder's College Pub, Newyork.
3. **Ranga,** *Animal Behaviour*, Agrobios, India, 2000.
4. **Reena Mathur**, *Animal Behaviour,* Rastogi Publications, Meerut.

SEMESTER – IV

Skill Based Subject II

MULTISKILL DEVELOPMENT PAPER

Instructional Hrs : 45 **Sub Code: 13ZOUS402**

Max. Marks : 100 (ESE– 60 CIA – 40) **Credits: 3**

Aim: To equip the students with knowledge on all topics as desirable from the point of view of brilliant success in the competitive examinations.

Objective: To familiarize the students with various types of tests that are employed by the diverse examining bodies.

UNIT I **9 Hrs.**

Communication: Question tag – Gerund and Infinitives – Spotting the errors – Vocabulary – Synonyms – Antonyms - Prepositions – Articles – One word substitution – Sentence completion.

UNIT II **9 Hrs.**

Numerical Aptitude : Problems on numbers - Problems on Ages – Percentage - Profit and loss - Ratio & Proportion - Time & Work - Time & Distance - *Simple Interest* - Compound Interest.

UNIT III **9 Hrs.**

Critical Reasoning : Logical Inference Questions and Syllogism.

Analytical Reasoning : Arrangement problems – Family / Blood Relation Qualms – Sense of Directions – Age Doubts.

Verbal Reasoning : Verbal Analogy (Letter series and number series only) – Coding and Decoding.

UNIT IV **9 Hrs.**

Presentation Skills - Choosing a topic – Gathering the material – Organizing the speech- Presentation through PowerPoint – Soft Skills - *Resume Preparation* – Interview Tips and Questions.

UNIT V **9 Hrs.**

Formal project report – Acknowledgement – Review of literature – Materials and Methods – Results – Discussion – Summary – References.

Mechanical elements – Cover – Title page – Table of Content – List of Illustrations – List of symbols—Glossary.

REFERENCE BOOKS:

1. **Hari Mohan Prasad & Uma Rani Sinha. 2011.** Objective English for Competitive Examinations. New Delhi: Tata McGraw Hill Education Private Ltd. (Unit – I)
2. **Agarwal R.S.,** Quantitative Aptitude. S.Chand 2010. (Unit - II)
3. **Edgar Thorpe**, Test of Reasoning for Competitive Examinations –4th edition, Tata McGraw-Hill Publishing Company Limited, New Delhi. (Unit – III)
4. **Agarwal R.S.**, A Modern Approach to Verbal Reasoning (Fully Solved) –Revised Edition, S.Chand Company Limited, New Delhi, 2012. (Unit – III)
5. **Alex K.,** Soft Skills-Know Yourself and Know the World. S.Chand Company Ltd., 2011(Unit-IV)
6. **Kumar K.L.,** "Your Interview" S.Chand and Company Ltd., New Delhi, 2000. (Unit-IV)
7. **Gurumani N.,** Scientific Thesis writing and Paper presentation.MJP Publishers 2010. (Unit - V)

SEMESTER - III & IV

Core Practical - II

(Based on C4 & C5)

Instructional Hrs.: 60 **Sub. Code : 14ZOUCP02**

Max. Marks : CIA-40; ESE-60 **Credits : 4**

DEVELOPMENTAL BIOLOGY

Different types of eggs. (Slides & Specimen)

Embryology of Frog – Slides.

Placenta of Mammals – Sheep & man.

EVOLUTION

Study of any four fossils.

ENVIRONMENTAL BIOLOGY

Estimation of dissolved Oxygen. (Pond and River water)

Estimation of Salinity. ,,

Estimation of pH using pH paper. ,,

Estimation of free Carbon di oxide. ,,

Estimation of Carbonates. ,,

Estimation of Bicarbonates. ,,

Estimation of Calcium ,,

Study of Intertidal fauna – Rocky, Muddy and Sandy shore.

Analysis of Zooplankton in given water sample.

Study of Animal relationship – Commensalism, Mutualism and Parasitism.

Visit to Shore / Pond / Zoological park / Wild life Sanctuary / Biosphere reserves.

Field Study : Observe and identify any 15 Avian fauna.

A report must be submitted along with the record.

ANIMAL BEHAVIOUR

Social behaviour – Honey Bees

SPOTTERS:

A. Descriptive notes:

Hygrometer, Anemometer, Rain gauge, Thermometer, pH meter and D.O. Meter.

B.Draw labelled sketch :

Freshwater plankton– Nauplius larva, Cypris, Daphnia, Cyclops and Zoea larva.

C. Stages of development

Frog embryology – Egg, Sperm, 2 celled stage, 4 celled stage, Blastula and Gastrula.

D. Ecological Adaptations and Animal relationship:

Intertidal fauna –Mytilus, Balanus, Hippa, Solen, Nereis, Starfish, Sea anemone and Hermit crab – Shark and Suckerfish, Ascaris, Honeybee – Caste system.

E. Embryological / Evolutionary Importance:

Insect's egg, Hen's egg, Placenta of Sheep, Placenta of Man, Arca, Nautilus Natica and Micraster.

SEMESTER - V

Core paper - VI

CELL MOLECULAR BIOLOGY AND GENETICS

Instructional Hrs.: 75 **Sub.Code :08ZOUC506**

Max. Marks :CIA- 25; ESE-75 **Credits : 4**

Objectives : To illustrate and elucidate the basic structure and functions of cells and to explain the basic principles of heredity and mechanism of inheritance.

UNIT I **15 Hrs.**

Structure and functions of plasma membrane, Endoplasmic reticulum, Golgi bodies and *Lysosomes.*

UNIT II **15 Hrs.**

Structure and *functions of Ribosomes,* Mitochondria and Nucleus.

UNIT III **15 Hrs.**

Chromosome - Structure and Types, Nucleic acid – Structure of DNA and *RNA*.

Cell Division – Mitosis.

UNIT IV **15 Hrs.**

Mendel and his postulates – Monohybrid, Dihybrid, *Test cross*, Back cross and Laws of heredity. Multiple alleles- Blood groups and their inheritance.

UNIT V **15 Hrs.**

Linkage – Types -Linkage in Drosophila.

Crossing over – Mechanism, Theories and Significance. *Stern's experiment in Drosophila.*Mutation – Detection of mutation by CIB technique.

Chromosomal aberrations – Changes in the structure of Chromosome.

Note: *Italics* denotes topics for self study.

TEXT BOOKS

1. **Arumugam.N.**, *Cell and molecular biology*, Saras Publications, Nagarcoil.
2. **Meyyan R.P.,** *Genetics*,SarasPublications,Nagarcoil.

REFERENCE BOOKS

1. **De Robertis E.D.P. and De Robertis E.M.P.,** *Cell and molecular biology*, B.I Waverly Pvt. Ltd., New Delhi, 1998.
2. **Verma P.S. and Agarwal V.K.,** *Cytology*, S.Chand & Co., New Delhi, 1991.
3. **Verma P.S and Agarwal V.K.,** *Genetics*, S.Chand & Co., New Delhi, 2004.
4. **Winchester A.M.,** *Genetics*, Oxford, IBH Publication, 3rd Edition

SEMESTER - V

Core paper - VII

MICROBIOLOGY AND IMMUNOLOGY

Instructional Hrs.: 75 **Sub.Code :08ZOUC507**

Max. Marks : CIA-25 ; ESE-75 **Credits : 4**

Objectives : To understand the basic principles and applications of Microbiology and Immunology.

UNIT I **15 Hrs.**

General Characteristics of Bacteria – Structure, Movement, Nutrition, Respiration and Reproduction. Gram's Staining – Principle and method. Types of culture media – Batch and Continuous culture.

UNIT II **15 Hrs.**

General characteristics of Virus –Structure of Phytophage (TMV), Zoophage (HIV) and Bacteriophage (T_4). Lytic and Lysogenic cycle of T_4 phage.

General characteristics of Fungi – Morphology, Physiology and Multiplication of Yeast and Penicillium.

UNIT III **15 Hrs.**

Control of Bacteria – Sterilization by heat radiation and air filter.

Microbiology of foodborne diseases, Food poisoning, Principles of spoilage and *Food preservation.*

UNIT IV **15 Hrs.**

Innate immunity – Physical, Mechanical and *Cellular factors.* Acquired immunity – Active and Passive immunity.Cells of Immune system – Stem cells – Lymphocytes. Lymphoid organs – Primary – Thymus and bone marrow. Secondary – lymph node and spleen.

UNIT V **15 Hrs.**

Antigen – Essential factors for antigenicity and *cross reacted antigens*, Immunoglobulins – classes, properties and structure of IgG. Hyper sensitivity.

Note: *Italics* denotes topics for self study.

TEXT BOOKS

1. **Dulsy Fatima & Arumugam N**., *Immunology*, Saras publication Nagarcoil, 1996.
2. **Arumugam et.al.,** *Microbiology,* Saras publication, Nagarcoil, 1996.

REFERENCE BOOKS

1**. Dubey J.,** *Immunology*, Saras Publication, Nagarcoil.

2**. Sharma P.D.,** *Microbiology*, Rastogi publication, Meerut.

3**. Tizard I.R.,** *Immunology – An introduction*, Sounders College Publication, Philadelphia 3rd Edition.

SEMESTER - V

Core paper - VIII

BIOSTATISTICS, BIOINFORMATICS AND COMPUTER APPLICATIONS

Instructional Hrs.: 60 **Sub.Code :09ZOUC508**

Max. Marks : CIA-25; ESE-75 **Credits : 4**

Objectives : To understand the basic principles and applications of Biostatistics, Bioinformatics and Computer Applications.

UNIT I **12 Hrs.**

Data – Methods of collection – Classification and tabulation – Graphic and diagramatic representation, Arithmetic mean, median and *mode*.

UNIT II **12 Hrs.**

Standard deviation – Standard error – Students 't' test – Correlation – *types.*

UNIT III **12 Hrs.**

Introduction to computer – *Characteristics* – History – Classification – Generations – Components and functions of computers. Comparison of Hardware and Software.

UNIT IV **12 Hrs.**

Basic ideas about computer languages. Brief account on computer packages – MS Word, MS Excel and MS Power point.

UNIT V **12 Hrs.**

Bioinformatics – Definition and Scope, Biological databases – Objectives, Properties and Classification. Bioinformatic tools – Uses and Classification – BLAST. *Application of Bioinformatics.*

Note: *Italics* denotes topics for self study.

TEXT BOOKS

1.**Kumaresan V. and Sundaralingam K.,** *Bioinformatics*, Saras Publication, Nagarcoil.

2.Ramakrishnan P., *Biostatistics*, Saras Publications, Nagarcoil.

REFERENCE BOOKS

1.**Alexis Leon and Mathew Leon** – *Fundamentals of Information Technology*, Leon Tech World.

2.**Gupta S.P**., *Statistical method*s, Sultan & Sons Publications.

3.**Mani K and Vijayaraj A.,** *Bioinformatics for beginners,* Saras Publications, Nagarcoil.

4.**Mittal C.,** *Fundamentals of Information Technology,* Pragathi Prakasam, Meerut 2003.

SEMESTER - V

Core paper - IX

HUMAN GENETICS AND COUNSELLING

Instructional Hrs.: 60 **Sub.Code :10ZOUC509**

Max. Marks : CIA-25;ESE-75 **Credits : 4**

Objective : To understand the various genetic disorders in man.

UNIT I **12 Hrs**.

Human chromosome – Historical background, Location, Number, Shape, Morphology Chemistry, Classification and nomenclature. Idiogram – Banding methods (Q, C, G, R). Sex determination – Chromosomal method and Gynandromorph. *Twins and their significance in Genetics.*

UNIT II **12 Hrs**.

Autosomal dominant diseases – Polydactyle and Huntingtons chorea.

Autosomal recessive diseases – Albinism and Sickle cell anaemia, X–linked diseases – *Haemophilia and Colour blindness.*

UNIT III **12 Hrs.**

Syndromes – Down's syndrome, Turner's Syndrome and Klinefelter's Syndrome.

Dermatoglyphics – Terminology –Types of ridges - *Dermatoglyphic features of Down's syndrome.*

UNIT IV **12 Hrs.**

Genetic counselling –Definition – Aim and Procedure in Genetic counselling. *Amniocentesis* – Pedigree analysis - Definition- Uses- Recording a Pedigree chart-Pedigree patterns for polydactyle and albinism

UNIT V **12 Hrs.**

Population Genetics – Gene frequency and genotype frequency. Hardy – Weinberg principle and its application in human population. *Inbreeding and out breeding.* Future of human genetics

Note: *Italics* denotes topics for self study.

TEXT BOOK

1. **Meyyan R.P.,** *Genetics,* Saras publication, Nagarcoil, 2004.

REFERENCE BOOKS

1. **Sanjay Mandal.,** Fundementals of human genetics New Central Book Agency(p) Ltd.1996.

2. **Lynn B.Jorde**, **John c.Carey Michel J.Bamshad and Raymond L.White**., Medical Genetics Mosby Publication 1999.

2. **Gupta P.K.,** *Genetics,* Rastogi publication, Meerut, 2000.

3. **Sam Singer.,** *Human genetics*, Freeman and company, Newyork, 1985.

SEMESTER V

Core Paper X: BIOPHYSICS, BIOCHEMISTRY AND BIOINSTRUMENTATION

Instructional Hours : 60 Hrs **Code: 14ZOUC510**

Max.Marks : CIA-25;ESE-75 **Credits: 4**

Objectives: To understand the basic principles of Biophysics, Biochemistry and Instruments useful for biological studies.

Unit I **12 Hrs**

Physical quantities and their units – Metric system, Conversion of units. Membrane Biophysics – Active transport, Passive transport, Diffusion, *Osmosis*, Hydrotrophy, Adsorption.

Unit II **12 Hrs**

Classification, structure and functions of Carbohydrates, Proteins and Lipids. Enzymes – Classification – Properties, chemical nature and mechanism of enzyme action – Factors affecting enzyme action – *Enzyme inhibition*.

Unit III **12 Hrs**

Water and mineral metabolism – Distribution of fluids in the body – Water metabolism – Physiological functions of water – Dehydration. Mineral metabolism – Calcium – Sodium – Potassium – Chlorine – Sulphur Trace elements - Iron – Iodine. Acid – Base regulation – Buffers – Acid-Base imbalance – *Alkalosis.*

Unit IV **12 Hrs**

Microscopy – Principles and types (*Light*, Phase contrast and Electron microscope). Centrifuge – Principle and types (Clinical and Ultra centrifuge). pH meter principles and applications. Spectrophotometer – Principles & applications.

Unit V **12 Hrs**

Chromatography – Principles, types and applications (*Paper*, Thin layer and Column). Electrophoresis – Principles & types (Paper and gel) – PAGE. Radio isotopic techniques – Radio immune assay, Biochemical applications of Radio isotopes.

Note: *Italics* denotes topics for self study.

TEXT BOOKS

1. Narayanan L.M. et al., *Biochemistry*, Saras Publications, 2013.

2. Arumugam. N. & Kumaresan. V., *Principles and techniques of Biophysics*, Saras Publications, Nagercoil, 2015.

3. Anne & Arumugam, *Biochemistry and Biophysics*, Saras Publications, 2014.

REFERENCE BOOKS

1. **Powar C.B. and Chatwal. G.R.,** *Biochemistry,* Himalaya Publishing House, Delhi,2012.
2. **Ramakrishnan.S., Prasannan. K.G., and Rajan. R.,** *Text Book of Medical Biochemistry,* Orient Longman Limited, 2012.
3. **Albert. L.Lehninger, David.L.Nelson., Micheal.M.Cox,** *Principles of Biochemistry,* CBS Publishers & Distributors, Delhi, 2012.
4. **Harold Varley,** *Practical Clinical Biochemistry,* CBS Publishers, 2010.

SEMESTER -V

SKILL BASED SUBJECT III- ANIMAL FARMING

Instructional Hours : 45 Hrs **Code: 16ZOUS503**

Max.Marks : CIA-25;ESE-75 **Credits:3**

Objectives: To acquire basic knowledge on Traditional farming and to study the nutritive value of by-products of animal farming.

Unit I **9 Hrs**

Cattle farming: Cattle breeds of India - Kangeyam,Gir, Red Sindhi, Jersey, Ongole, Murrah, Jamunapari, Malapari and Thalacherry. Dairy products- Milk, Curd, Butter, Ghee, Cheese, Khoa and Paneer.

Unit II **9 Hrs**

Poultry farming: Types of poultry birds- Layers- White Leghorn, Plymouth rock, Australop and Desi. Broilers- Sussex and Doking. Principles for the construction of poultry house- Deep litter House and Cage house. Poultry products- Egg, Meat and by- products. Nutritive value of egg.

Unit III **9 Hrs**

Fish farming: Types of culturable fishes- Catla catla, Labeo rohita, Cirrhinus mrigala, Cyprinus carpio, Tilapia mossambica and Mugil oeur. Rearing methods- Finculture and Mariculture, Fishery by- products.

Unit IV **9 Hrs**

Rabbitry: Importance and scope of Rabbit production. Breeds of Rabbit- Angora, White Giant and Chinchilla. Housing and sanitation of rabbits. By- products of Rabbit farming.

Piggery: Breeds of Pig- Desi, Hampshire and Large White Yorkshire. Management of Piggery.

Unit V **9 Hrs**

Present and future of Animal farming in India. Development of Artificial Insemination Programmes. Veterinary public health in India.

REFERENCE BOOKS

1. Banerjee. C., A text book of Animal Husbandry, Oxford & IBH Publication, New Delhi., 2010.

2. ICAR., New Delhi- Hand book of Animal Husbandry., 2008.

3. Schmidt G.H and Van Vleck T.D. Principles of Dairy Science, Surgeet Pvt Ltd.,

4. C.B.L.Srivastava- Fishery Science and Indian Fisheries, Kitab Mahal Publication, Allahabad. 2008.

5. **Pandey and Shukla-** Fish and Fisheries, Rastogi Publications, Meerut, 2011-2012.

6. **NPCS Board & Consultant**- The complete technology book on Meat, Poultry and Fish processing, 2013.

7. **M.E.Ensminger**- Poultry Science, CBS Publishers and Distributers, 2015.

SEMESTER - VI

Core paper - XI PHYSIOLOGY AND ENDOCRINOLOGY

Instructional Hrs.: 90 **Sub.Code : 14ZOUC611***

Max. Marks : CIA- 25; ESE-75 **Credits : 4**

Objective : To understand the various aspects of physiological activities of animals with special reference to human beings.

UNIT I **20 Hrs.**

Nutrition : Types of Nutrition, Digestion and absorption of carbohydrates, fats and proteins.

Respiration : Types of Respiration, *Respiratory pigments*, Gaseous transport and Bohr's effect

UNIT II **15 Hrs.**

Circulation : Types of heart – Neurogenic and Myogenic. Origin, Conduction and regulation of heart beat. *Blood – Composition and functions*. Blood coagulation.

Excretion : Ammonotelism,Ureotelism and Uricotelism.Mammalian nephron–Urine formation.

UNIT III **15 Hrs.**

Nerve physiology : *Types of neurons* – Initiation and conduction of nerve impulse – Synapse.

Muscle Physiology : Types of muscles, Structure of muscle, Physiology and Chemistry of Muscle contraction – Theories of muscle contraction

UNIT IV **20 Hrs.**

Endocrinology : Morphology, structure, secretions and functions of endocrine glands – Pituitary, Thyroid, Parathyroid and – *Islets of Langerhans.*

UNIT V **20 Hrs.**

Endocrinology : Morphology, structure, secretions and functions of endocrine glands – Adrenal gland, Testis and Ovary. *Placental hormones.*

Note: *Italics* denotes topics for self study.

TEXT BOOK

1.Arumugam N. and Maria Kuttikan., *Animal Physiology*, Saras Publications, Nagarcoil

REFERENCE BOOKS

1. **Dalela R.C and Verma S.R.,** *Animal Physiology and Related Biochemistry*, S.Chand & Co., New Delhi, 1995.
2. **Goel K.A and Sastry K.V.,** *Animal Physiology*, Rastogi publications, Meerut, 5th Edn.,1988-89.
3. **Prosser C.L. and Brown F.,** *Comparative Animal Physiology*,N.B.Saunders Company, 3rd Edn., 1973.

SEMESTER - VI

Core paper – XII- BIOTECHNOLOGY

Instructional Hrs.: 90 **Sub. Code : 14ZOUC612***

Max.Marks : CIA-25;ESE-75 **Credits:4**

Objectives: To understand the basic principle behind techniques involved in Bio-technology and to understanding the biodiversity of resources that could yields products useful to man.

UNIT – I **20 Hrs.**

Definitions and *Landmarks in the history of Biotechnology*. Major areas of Biotechnology. Outlines of Genetic Engineering – Restriction enzymes, Vectors, Plasmids-PBR322. Principles of PCR (Polymerase Chain Reaction).

UNIT-II **15 Hrs.**

Principles and techniques of animal cell culture – *Applications of Animal Cell culture* Protoplast fusion – Methods and uses. Blotting techniques.Gene cloning in Eukaryotes.

UNIT-III **20 Hrs.**

Transgenic technology – Transgenic Mice. Monoclonal antibodies – production and applications. Health care products – Production of Insulin and *Vaccines.*

UNIT – IV **15 Hrs.**

Biogas production. Bio-fertilizer (Rhizobium). Biopesticides (Bacterial pesticides). Production of Single Cell Protein – Spirulina and *Mushroom culture.*

UNIT-V **20 Hrs.**

Sewage management. Fermenter design and types. Enzyme extraction and purification – *Industrial application of enzymes*. Immobilization of enzymes and its application. Cryobiology – Methods of cryopreservation.

Note: *Italics* denotes topics for self study.

TEXT BOOK

1.**Kumaresan V.,** *Biotechnology,* Saras Publication, Nagercoil, 2005.

REFERENCE BOOKS

1.**Dubey R.C.,** *Biotechnology* ,PG Publishing Pvt.Ltd., New Delhi,1994.

2.**Jogdand S.N.,** *Environmental Biotechnology*, Himalaya Publishing House, Bombay, 1995.

3.**Freshney R .I**.,*Culture of Animal cells*, Wikyliss Publication ,2000.

SEMESTER - V

Elective I: MEDICAL LABORATORY TECHNOLOGY – Paper I

Instructional Hours: 60 Hrs **Code: 16ZOUE501**

Max.Marks : CIA-25;ESE-75 **Credits: 4**

Objectives: To understand the principles and applications of clinical instruments.

Unit I **12 Hrs**

Introduction to clinical laboratory technology: Scope of clinical laboratory techniques. Basic needs of a clinical laboratory. Cleaning and maintenance of glasswares. Sterilization – Physical and Chemical methods. Disposal of specimens and infected materials. Safety precautions and first aid in clinical laboratory.

Unit II **12 Hrs**

Clinical lab instruments and apparatus: Light microscope, Centrifuge, Spectrophotometer, Autoclave, Incubator, Colony Counter, Serological water bath, Physical balance, Hot air oven, Sphygmomanometer and Stethoscope**.**

Unit III **12 Hrs**

Haematology : Specimen collection – Anticoagulants - Preparation of serum – Total RBC count – Total WBC count – Differential leucocyte count – Haemoglobin estimation (Sahli's method) – Erythrocyte Sedimentation Rate (ESR) (Wintrobe method and Westergren method).

Unit IV **12 Hrs**

Heamatology: Determination of bleeding time – Determination of Clotting time – Calculation of Red Blood Cell indices – Haematocrit (Wintrobe method), MCV, MCH and MCHC. ABO blood grouping and Rh factor (Slide method). Cross matching of blood (Coomb's test).

Unit V **12 Hrs**

Urine Analysis: Composition of normal urine. Urine sample - Collection, types and preservation. Physical examination of urine. Microscopic examination of urine sediments. Chemical examination of urine – Detection of glucose (Benedict's test), Protein (Heat test), Blood (Benzidine test), Bilirubin (Fauchet test), Urobilinogen (Ehrlich's test) and Bile salt.

TEXT BOOKS

1. Kanai L. Mukherjee. Medical Laboratory Technology, vol I, II, III. 2nd edition Tata McGraw-Hill Education, New Delhi, 2010.

2. Sach Dev.K.N. Clinical pathology and Bacteriology**,** 9th edition. Jaypee Brothers Medical Publishers, New Delhi, 2000.

REFERENCE BOOKS

1. Talib V.H. Hand Book of Medical Laboratory Technology**,** 2nd edition CBS Publishing company, New Delhi, 2012.

2. Ramnik Sood. Haematology, 6th edition Jaypee brothers Medical Publishers, New Delhi, 2010.

3. Samuel. Notes on Clinical laboratory Techniques, M.K.G. Iyer & Sons, Madras.

SEMESTER - VI

Elective II – MEDICAL LABORATORY TECHNOLOGY - Paper II

Instructional Hrs: 60 **Sub.Code :16ZOUE602**

Max. Marks : CIA- 25; ESE-75 **Credits : 4**

Objective: Describing the practical applications of clinical laboratory technology.

UNIT:I 1**2Hrs.**

Faecal Examination: Physical and microscopic examination of faeces. Testing faeces for occult blood (Benzidine test). Laboratory diagnosis of helminthes - Direct smear examination and Sodium chloride. Examination of ova, cyst and adult helminth worms (Ascaris lumbricoides and Taenia solium).

Liver Function Test: Serum Bilirubin (Total and Direct), Serum Protein and Serum Cholesterol (Total).

UNIT II **12 Hrs.**

Gastric Function Test: Collection of gastric content and determination of gastric acidity.

Pancreatic Function Test: Collection and physical examination of duodenal content. Determination of Pancreatic enzyme – Trypsin.

UNIT III **12 Hrs.**

Sputum Examination: Collection of sputum. Physical and microscopic examination of sputum.

Cerebrospinal Fluid Examination: Collection and processing of CSF. Physical, Chemical and Microscopic examination of CSF.

Seminal Fluid Examination: Collection and Microscopic examination of seminal fluid – Sperm motility and Sperm count.

UNIT IV **12 Hrs.**

Endocrine Function Test: Determination of blood sugar (Folin Wu method) – HbA_{1C} Test. Test for Thyroid Hormones (TSH, T3 and T4). Test for Female Hormones (FSH, Progesterone and HCG).

UNIT V **12 Hrs.**

Microbiological Tests: Collection of Microbiological specimens and precautionary measures for investigation. Hanging drop preparation – Wet preparation – Examination of Throat Swab. Preparation of smears - Gram's staining. Indigenous body flora – Significance in health and diseases of man.

Routine Mycological methods – Superficial mycosis and Dermatophytes, Intermediate mycosis, Superficial deep mycosis, Deep or Systemic mycosis.

TEXT BOOKS

1. Kanai L. Mukherjee. Medical Laboratory Technology I, II, III.2nd edition Tata McGraw- Hill Education, New Delhi, 2010.

2. Sach Dev. K.N. Clinical pathology 9th edition Jaypee Brothers Medical Publishers**,** New Delhi. 2000.

REFERENCE BOOKS

1. Arora.D.R. Medical Mycology, 1st edition CBS Publishers & Distributors, New Delhi. 2014.

2. Dubey R.C. and Maheswari.R. Text Book of Microbiology. 3rd edition S. Chand Publishers New Delhi. 2013.
3. Anandha Narayanan. R. and Panicker C.K. Text Book of Microbiology. 9th edition, edited by Arti Kapil Universities Press Private Ltd. 2014.

SEMESTER-VI

PART IV – Skill Based Subject – IV

SERICULTURE

Instructional hrs: 45 **Subject code :11ZOUS604**

Max.Marks : CIA-25;ESE-75 **Credits : 3**

Objectives: To prepare the students to acquire adequate knowledge in Sericulture and to be a self employed youth

UNIT I **9 Hrs.**

History and economic importance of Sericulture. Types of Silk Worms - mulberry and Non-mulberry (Tasar, Eri and Muga). *Silk industry in India*.

UNIT II **9 Hrs.**

Moriculture – *methods of propagation*, methods of irrigation, Pruning and harvesting

UNIT III **9Hrs.**

Rearing equipments – Rearing stand – Rearing trays – Chop stick – Feather – Leaf basket – Leaf chamber – Chopping Knife – Feeding stand – cleaning net and mountages. Seed production (Grainage). *Feeding of silk worm*.

UNIT IV **9 Hrs.**

Mounting, Process of spinning and harvesting. Cocoons – Physical and Chemical characteristics. *Defective Cocoons*. Diseases of Silkworm – Pebrine, Flacherie and Grasserie.

UNIT V **9 Hrs.**

Stiffing, Process of reeling, Finishing, Testing and Marketing. *By products of silk reeling*.

TEXT BOOK:

Ganga.G & Sulochana Shetty.J. – *An Introduction to Sericulture*.OXFORD & IBH Publications,Co.PVT.New Delhi.

REFERENCE BOOKS:

1. Arumugam N. -*Applied Zoology* – Saras Publications.
2. Shukla.G.S. & Upadhyay.V.B.- *Economic Zoology*, Rastogi publications,Meerut.
3. Ravindranathan.K.R. –*A Text book of Economic Zoology*,Dominant publications, New Delhi.

SEMESTER – V & VI

Core practical - III

(Based on C_6, C_7 C_8 & C_9)

Instructional Hrs.: 60 hrs. **Sub. Code : 14ZOUCP03**

Max. Marks :CIA- 40; ESE-60 **Credits : 4**

CELL MOLECULAR BIOLOGY

Squash preparation of onion root tip to show Mitosis.

Identification of Salivary gland chromosomes in Chironomous Larva (Demonstration only)

GENETICS

Culture of Drosophila.

Drosophila sex identification.

Identification of Mutant forms.

Survey of Mendelian traits in human population.

Variation in finger prints.

Identification of barr body.

MICROBIOLOGY

Sterilization methods - Autoclave – Hot air oven.

Serial dilution technique for soil samples.

Preparation of culture media for bacteria -Nutrient broth and nutrient agar.

Determination of texture, pH and temperature in soil samples.(Red soil, Loamy soil, Clay soil)

Perform hanging drop mount method to examine the motility of bacteria.

Differential staining of given culture to identify gram positive and gram negative bacteria.

IMMUNOLOGY

Preparation of blood smear.

Leucocyte – differential count.

Lymphoid organs – Thymus, Spleen.

BIOSTATISTICS AND COMPUTER

Find out arithmetic mean, median and mode for biological data.

Find out standard deviation for biological data.

Study of computer components.

SPOTTERS:

A. Comment on the stage of cell division/cell organelles

Stages of Mitosis – Prophase, Metaphase, Anaphase and Telophase.

Cell organelles – Mitochondria, Endoplasmic reticulum, Nucleus.

B. Genetic Importance

Drosophila- Normal – male and female, Mutant – Bar eye, Vestigeal wing, Polytene chromosome and Lamp brush chromosome.

C. Microbiological Significance

Vibriocholerae, Lactobacilli, HIV, Bacterio phage, Yeast, Mushroom, Pencillium.

D. Immunological Significance

Thymus, Spleen,Vaccine - BCG, TAB, DPT, Hepatitis B.

E. Descriptive Notes

Autoclave, Hot air oven,Nutrient agar medium,Inoculation needle, Culture late,Colony counter.

Computer Components - Key board, Mouse, CPU and Monitor.

SEMESTER – V& VI

Core Practical – IV

(Based on C_{10}, C_{11} & C_{12})

Instructional Hrs : 90 **Sub.Code : 14ZOUCPO4**

Max. Marks : CIA – 40; ESE – 60 **Credits: 4**

BIOCHEMISTRY

Biochemical detection of Carbohydrate, Proteins and Lipids.

Gel electrophoresis (Demonstration only)

Separation of aminoacids by paper chromatography

PHYSIOLOGY

Qualitative detection of excretory products.

Qualitative detection of Albumin, Urea and sugar in urine sample.

Total count of RBC

Total count of WBC.

Demonstration of blood pressure in man.

BIOTECHNOLOGY

Blotting techniques – Observation of photographs.

Isolation of human DNA from buccal cavity.

Immobilization of cells

Visit to Biotechnology Industry / Laboratory – A report to be submitted along with the record.

SPOTTERS

A. Comment on

Brain, Lung, Heart, Liver, Kidney**.**

B. Histology of endocrine glands

Pituitary, Thyroid, Adrenal, Testis, Ovary

C. Draw labeled sketch

Striated muscle, Non-striated muscle,Cardiac muscle, Neuron, Human blood.

D. Descriptive notes

Stethoscope, Sphygmomanometer, Southern blotting, Western blotting, Paper chromatography, Gel electrophoresis,Spectophotometer,Laminar air flow.

E. Biotechnological significance

E.coli, Recombinant pBR 322 plasmid, Insulin, Spirulina, Biofertilizer – Rhizobium and Biopesticide – Bacillus thuringiensis, Bio reactor.

SEMESTER - V & VI

Elective Practical – MEDICAL LABORATORY TECHNOLOGY

(Based on Elective I&II)

Instructional Hrs. 60 **Sub. Code: 16ZOUEP01**

Max. Marks: CIA- 40; ESE-60 **Credits : 3**

Experiments:

1. ABO and Rh Grouping
2. RBC Total Count
3. WBC Total Count
4. Differential Leucocyte Count
5. Haemoglobin estimation
6. Bleeding time of Blood
7. Clotting time of Blood
8. Estimation of ESR
9. Specific gravity of Urine
10. Albumin in Urine
11. Glucose in urine
12. Bile salts in urine
13. Detection of Urobilinogen
14. Estimation of Glucose in blood
15. Hanging drop preparation
16. Gram's staining

Spotters:

Light Microscope, Autoclave, Incubator, Colony counter, Sphymomanometer, Stethoscope, Haemometer, Haemocytometer, ESR apparatus, Urinometer, Folin Wu sugar tube, Ryle's tube, Saccharometer, Glucometer, Streptococcus pyogenes, Corynebacterium diphtheriae, Mycobacterium tuberculosis, Haemophilus influenza, Diplococcus pneumoniae, Candida albicans.

Internship Programme:

Each student must undergo an internship programme in a Medical/Clinical laboratory for ten days. The certificate and report should be submitted along with the record.

SEMESTER I

CODE	COURSE TITLE
18ZOUA101	INVERTEBRATA AND CHORDATA

Category	CIA	ESE	L	T	P	Credit
Allied	20	55	56	4	-	4

Preamble

The course imparts knowledge on basic concepts and distinctive features of taxonomic classes in Zoology through the study of the major heritage of Invertebrate and Vertebrate animals, with special emphasis on the structure, organization and functional details.

Course Outcomes

On successful completion of the course, students will be able to understand the structural-functional relationships of living organisms and place the subject in the larger context and experience on a global scale.

CO Number	CO Statement	Knowledge Level
CO1	To learn and recollect the fundamentals such as systematic position, morphology, structural modification in various groups of Invertebrates & Chordates.	K1
CO2	To understand the structural and physiological processes occurring in various organisms and are distinctive to each Phylum and Class.	K2
CO3	To analyze the physiology of the organisms from Invertebrates to Chordates with special emphasis on their life history and development.	K2
CO4	To analyze and correlate the affinities and adaptations of animals to different modes of life.	K2, K3
CO5	To develop a general familiarity with all major groups of animals and to discuss the diversity of both Invertebrate and Vertebrate animal life and their fascinating adaptations in all conceivable ecological niches.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	S
CO2	S	S	M	M	S
CO3	S	S	M	S	M
CO4	S	M	M	S	S
CO5	S	S	M	M	S

S- Strong; M-Medium

Syllabus

UNIT I **8 hrs**

General Characteristics of Phylum Protozoa, Porifera and Coelenterata.

Type Study : Paramecium caudatum - External features - Nutrition - Locomotion – Reproduction - Asexual – Binary fission, Sexual reproduction - Conjugation, Autogamy, Endomixis, Hemimixis and Cytogamy.

UNIT II **12 hrs**

General Characteristics of Phylum Platyhelminthes, Aschelminthes, Annelida and Arthropoda.

Type Study : Periplaneta americana (Cockroach) - External features - Body wall - Body cavity - Mouth parts - Digestive system - Blood vascular system - Respiratory system – Excretory system - Nervous system - Reproductive system.

UNIT III **10 hrs**

General Characteristics of Phylum Mollusca and Echinodermata

Type Study : Asterias rubens (Starfish) - External features - Pedicellaria structure and function - Digestive system - Respiratory system - Water vascular system - structure and function- Circulatory system - Excretory system - Reproductive system – Life cycle.

UNIT IV **15 hrs**

General Characteristics of Class Pisces, Amphibia and Reptilia

TypeStudy : Scoliodon sorrakowah (Shark) (Excluding Endoskeleton)- External features- Digestive system - Respiratory system - Circulatory system - Nervous system - Urinogenital system.

UNIT V **15 hrs**

General Characteristics of Class Aves and Mammals

Type Study : Rana hexadactyla (Frog) (Excluding endoskeleton) - External features – Sexual dimorphism - Locomotion- Digestive system- Respiratory system- Circulatory system- Nervous system- Urinogenital system - Life cycle.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ekambaranath Ayyar and Anantha Krishnan T.N	A Manual of Zoology Vol I Part I & II	Viswanathan Publication	2003 Reprint

2.	Jordan. E.L and Verma.P.S.	Chordate Zoology	S. Chand & Co, New Delhi	2014 & 2th Edn

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Kotpal. R.L	A Modern text book of Zoology	Rastogi Publication	2009 & 4th Edn
2.	Dhami and Dhami	Invertebrate Zoology	Chand & Co	2015

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Web Resources

- http://users.rcn.com/jkimball.ma.ultranet/BiologyPages/I/Invertebrates.html
- https://www.britannica.com/animal/chordate
- https://study.com/academy/lesson/chordates-features-groups-characteristics.html

Pedagogy

- Lecture, Seminar, Quiz, Group discussion, Power point presentation, Charts, Models

SEMESTER II

CODE	COURSE TITLE
18ZOUA202	APPLIED ZOOLOGY

Category	CIA	ESE	L	T	P	Credit
Allied	20	55	56	4	-	4

Preamble

An introduction to application oriented fields in Zoology, with regard to their techniques used in traditional and modern methods. The study also makes the students to expertise in the area of applied subjects and to execute their learned skills practically.

Course Outcomes

On the successful completion of the course, students will be able to manipulate and gain hands on experience in the Applied Zoology.

CO Number	CO Statement	Knowledge Level
CO1	To gain knowledge on the significance of Aquaculture, Sericulture, Vermiculture, Apiculture and Haematology	K1
CO2	To identify the important species and culture methods available for rearing Silkworm, Earthworm, Fishes and Honeybees. To acquire technical skills in Haematology	K2
CO3	To analyze and interpret the production of economically valuable products with interrelated species and to interpret the Hematological results	K3
CO4	To become skill-based experts in the applied and technical fields of Zoology	K3
CO5	To acquire the entrepreneurship skills and professionalism for the economic upliftment.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	S	M	S	M	S
CO3	S	S	S	S	S
CO4	S	S	M	S	S
CO5	S	S	M	M	S

S- Strong; M-Medium

Syllabus

UNIT I **12 Hrs**.

AQUACULTURE

Definition - Scope - Types of Aquaculture - Freshwater Aquaculture - Pond, Dam & Lake, Brackish water Aquaculture - Marine aquaculture - Coastal & Off shore Aquaculture, Management of Fish farms. Culturable organism – Fin fishes. Feed organisms – Algae and Seaweeds. Integrated fish farming - Paddy cum fish culture. Preservation of Fishes - Methods of Preservation.

UNIT II **12 Hrs**.

SERICULTURE

Definition – Scope – History of Sericulture – Types of Silkworm – Tasar, Muga, Eri. Life cycle of Mulberry Silkworm *Bombyx mori*. Rearing Appliances – Rearing stand, Rearing tray, Ant wells, Paraffin paper, Foam rubber strips, Chop sticks, feather. Feeding Appliances – Leaf basket, Leaf chamber, Chopping board, Chopping knife, Mats, Feeding stand. Mountage – Chandrika.

UNIT III **12 Hrs**.

VERMITECHNOLOGY

Definition – Scope – Ecological Classification of Earthworm – Epigeic, Endogeic and Anecic. Life history of Composting Earthworm – *Eudrilus eugeniae*. Methods of Vermicomposting – Pit method and Heap method. Advantages of Vermitechnology – Vermiwash and its Applications.

UNIT IV **12 Hrs**.

APICULTURE

Definition – Scope – Choice of Bee in Apiculture – Desirable traits, Good choice, Poor choice, Best Choice. Kinds of Honey Bee – *Apis dorsata, A.florea, A. indica*. Development of Honey Bee – Egg, Larva, Pupa and Adult. Bee keeping – Modern bee keeping – Newton Hive. Bee comb – Storage cells, Brood cells, Queen cells, Drone cells, Worker cells. Honey Extraction. Honey – Properties – Chemical composition – Nutritional value – Medicinal value – Honey as food – Bee venom – Bees wax.

UNIT V **12 Hrs**.

HAEMATOLOGY

Blood - Components and functions – Collection of blood – Human blood groups – ABO grouping, Rh system, Determination of bleeding time – clotting time, Haemoglobin estimation by Sahli's method.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Shukla G.S and Upadhyay V.B	Economic Zoology	Rastogi Publications, Meerut, India	2010

2.	Pradip V.Jabde	Text Book of Applied Zoology	Discovery Publishing House, New Delhi	2005

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ganga.G & Sulochana Chetty. J.	An Introduction to Sericulture	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi	2010
2.	Ranganathan L.S.	Vermibiotechnology from soil health to human health	Agrobios, India.	2006
3.	Ashok K Rathoure	Applied and Economic Zoology	Daya Publishing House New Delhi	2015
4.	Banerjee.C	A text book of Animal Husbandry	Oxford and IBH publication, New Delhi	2018 reprint

Web Resources

- https://www.saraspublication.com/osc/catalog/applied-zoology-aquaculture-apiculture-sericulture-dairy-farming-p-37.html
- https://www.slideshare.net/atulthakur007/economic-zoology
- http://www.nios.ac.in/media/documents/dmlt/hbbt/Lesson-03.pdf

Pedagogy

Lecture, PPT, Quiz, Group Discussion, Seminar, Models, Specimens, Charts

SEMESTER I & II

CODE	COURSE TITLE
18ZOUAP01	ALLIED ZOOLOGY PRACTICAL

Category	CIA	ESE	L	T	P	Credit
Allied	20	30	-	-	90	2

Preamble

A practical oriented approach in zoology which solidifies student knowledge on morphology, function, and interconnections between organs and systems. To distinguish and apply skills in Haematological study and to enhance their knowledge in Applied Zoology.

Course Outcomes

On the successful completion of the course, students will able to learn anatomy and physiology of organisms and acquire technical skills in Haematology and culturing skills in Applied Zoology.

CO Number	CO Statement	Knowledge Level
CO1	To identify and recognize the different systems of Invertebrate and Chordates through live virtual dissection.	K2
CO2	To analyze and interpret the clinical significance of haematological experiments. To classify, compare and distinguish the importance of specimens, models and equipments.	K2
CO3	To execute the practical skills in culturing economically important organisms.	K3

Mapping with Programme Outcomes

CO_S	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S

S- Strong

Syllabus

Laboratory Exercises:

1. **COCKROACH** - Mouth parts, Salivary glands, Digestive system, Nervous system, Male and Female Reproductive system (live Dissection- Demonstation)
2. **FROG** - Digestive system, Arterial system, Venous system, Male and Female Urinogenital system (Virtual Dissection)

Mountings:

3. **COCKROACH** – Mouth Parts
4. **EARTHWORM** - Body setae

Experiments:

5. Blood grouping- ABO and Rh system.
6. Determination of bleeding time.
7. Determination of clotting time.
8. Haemoglobin estimation by Sahli's method.

Spotters:

Identify and comment on:
Paramecium, Earthworm, Cockroach, Starfish, Shark, Placoid Scale, Frog, Earthworm - Body setae, Penial setae, Vermicompost, Haemoglobinometer, Antisera A,B and D, Chandrika, Silk gland, Silkworm cocoon, *Catla catla*, *Tilapia mossambicus*, *Penaeus indicus*, Honey bee – Queen, Drones, Workers, Honey, Bee hive.

Pedagogy

- Demonstration, Field Study, Video Tutorials

SEMESTER –III

Non -Major -Elective –I

WILD LIFE DIVERSITY AND CONSERVATION

Instructional Hrs: 30 **Sub.Code:16ZOUN301**

Max.Marks: ESE -100 **Credits : 2**

Objectives: To acquire basic knowledge of Wildlife as a renewable natural wealth. Prepares the students to understand the wildlife fauna and diversity in order to appreciate, admire and conserve it.

Unit I **6 Hrs**

Wild life diversity - Diversity of fishes - Fresh water Fishes - Description, Distribution and status. *Diversity of Amphibians - Frogs– Description, Distribution and status*. Diversity of Reptiles - Snakes– Description, Distribution and status.

Unit II **6 Hrs**

Diversity of Aves - *Common House Sparrow* and Large Indian Parakeet- Description, Distribution and status. Diversity of Mammals- Nilgiri Thar, Indian Bustard- Description, Distribution and status.

Unit III **6 Hrs**

Sanctuaries and National parks in India. *Wild life Census techniques*. Man-Animal conflicts–Causes and concern. Project Elephant and Project Tiger.

Unit IV **6 Hrs**

Wild life and Human welfare–Causes of wildlife depletion - Need for conservation- *Modes of conservation –In situ & Ex situ.*

Unit V **6 Hrs**

Wild life heritage of India (Western Ghats). Biosphere Reserves – Mannar Biosphere Reserve. *Indian endangered fauna*. Wild life (Protection) Act, 1972.

Note: *Italics* denotes topics for self study.

REFERENCE BOOKS:

1. **Saharia V.B**., Wildlife in India, Nataraj Publications, Dehradun, 2009.

2.**Veer Bala Rastogi & Jayaraj**, Animal Ecology & distribution of animals, Kedarnath Ramnath, Delhi, 8th Edition, 2007.

3. **Verma P.S. & Agarwal V.K**., Environmental Biology, Rostogi Publication, Meerut, 2011.

4. **Robinson, Wl**. a**nd Eric, G. Bolen**, Wildlife Ecology and Management Mac Millan Publishing Co, 1984.

5. **Rodgers, W.A**. Techniques for Wildlife census in India – A Field manual– Wildlife Institute of India, Dehra Dun, 1991.

SEMESTER - IV

Non Major- Elective II

PUBLIC HEALTH AND HYGIENE

Instructional Hrs: 30 **Sub. Code: 16ZOUN402**

Max. Marks: ESE-100 **Credits : 2**

Objective: To create awareness about the significance of personal hygiene and protection of individual health from various diseases.

UNIT I **6 Hrs.**

Public Health and Hygiene – Definition - Public health organization - Public health activities. **Hygiene** - Food hygiene - Personal hygiene. Concept of health and wellbeing- Physical health, Mental health, Social health and Spiritual health.

Foods-Carbohydrate-Proteins-Lipids-*Vitamins*-Minerals. Balanced diet - calorie requirements. Nutritional requirements of special groups**.**

UNIT II **6 Hrs.**

Communicable diseases- Causes, Symptoms, Treatment, Prevention and control of Dengue fever, Tuberculosis, Hepatitis A, Amoebiasis and *Diarrhoea.*

UNIT III **6 Hrs.**

Non communicable diseases– Causes, Symptoms, Treatment, Prevention and control of Hypertension, Myocardial infarction, Stroke, *Diabetes* and Obesity.

UNIT IV **6 Hrs.**

Occupational health hazards- Physical, Chemical, Mechanical and Psychological hazards.

Social drugs- *Tobacco* – Alcohol - Narcotics.

UNIT V **6 Hrs.**

Women's health- Uterine fibroid- Polycystic ovary- Gonorrhoea- Osteoporosis – *Infertility*.

Non Governmental voluntary health organizations.

Note: Self study topics are denoted in *Italics*.

REFERENCE BOOKS

1. **R. Sornaraj and V.Kumaresan,** Public health and Hygiene. Saras Publication, Kanyakumari., 2010.
2. **N.Murugesh,** Anatomy, Physiology and Health Education. Sathya Publishers, Madurai, 2010.

3. **Deb A.C.,** Fundamentals of Biochemistry, New Central book agency Ltd., Calcutta, 8th Edition, 2002.
4. **Park and Park.,** Text book of preventive and Social Medicine, M/s. Banarsidas Bhanot Publishers, Jabalpur, 2005.
5. **Verma S.,** Medical Zoology, Rastogi Publications, Meerut, 2008.

SELF- LEARNING PAPER

APICULTURE

Max.Marks: ESE - 100 **Sub.Code: 13ZOUSLO4**

Credits: 5

Objective : To motivate the students for practicing apiculture as agrobased cottage industry.

UNIT I

Introduction – Scope – Honeybee classification – Types of honeybees – Social organization of honeybee colony.

UNIT II

Life history of honeybee – Selection of bees for culture. Flora for apiculture. Bee hive.

UNIT III

Methods of bee keeping – Indigenous method – Extraction of honey.Modern method of apiculture - Appliances for modern method - Advantages of modern method.

UNIT IV

Products of bee keeping – Honey – Production – Chemical composition – Storage. Bee wax- Chemical composition. Economic importance of Honey, Bee wax and Bee venom.

UNIT V

Diseases of honeybee and control measures. Enemies of honeybee. Bee keeping industry – Recent efforts.

REFERENCE BOOKS

1.Arumugam N., et al., *Applied Zoology*, Saras Publications, Nagarcoil, 2009.

2.Shukla G.S & Upadhyay V.B., *Economic Zoology*, Rastogi Publications, Meerut,2005.

3.Ravindranathan K.R., *A Text book of Economic Zoology*, Dominant Publishers, New Delhi, 2005.

QUESTION PAPER PATTERN FOR CORE AND ELECTIVE PAPERS IN ZOOLOGY

Duration : 3 hours Max.Marks : 75

ANSWER ALL QUESTIONS

DRAW DIAGRAMS WHEREVER NECESSARY

SECTION - A (10x1=10 Marks)

10 Questions (Two questions from each unit) (Multiple choice questions)

Each question carries one mark.

SECTION - B (5x5=25 Marks)

5 Questions (one question from each unit) with internal choice

Answer the following questions, each answer not exceeding 250 words

Each question carries 5 marks.

SECTION - C (5x8=40 Marks)

8 Questions (Open choice) 1 Question from each unit, subject to a maximum of two.

Answer any Five questions, each answer not exceeding 1000 words

Each question carries 8 marks.

QUESTION PAPER PATTERN FOR NON-MAJOR ELECTIVE & SELF STUDY PAPERS IN ZOOLOGY

Duration : 3hours Max.Marks.100

8 Questions (OpenChoice). 1 Question from each unit, subject to a maximum of two

Answer any Five Questions. Each Question carries 20 Marks.

QUESTION PAPER PATTERN-SKILL BASED SUBJECTS IN ZOOLOGY

Duration : 3hours **Max. Marks: 75**

8 Questions (Open Choice) 1 Question from each unit, subject to a maximum of Two.
Answer any Five Questions. Each Question carries 15 Marks.

QUESTION PAPER PATTERN FOR CORE AND ELECTIVE PRACTICALS

Duration : 3hours	**Max .Marks :60**
Q.1. Major experiment/ Flag labelling	**-20Marks**
Q.2. Minor experiment/ Flag labelling	**-10 Marks**
Q.3. Spotters A,B,C,D&E. Identification and notes (5X4)	**-20 Marks**
Record	**-10 Marks**
	.....
	60 Marks
	.....

QUESTION PAPER PATTERN FOR ALLIED ZOOLOGY PRACTICAL

Duration :3 hours	**Max.Marks :30**
Q.1. Major experiment/ Flag labelling	**-10 Marks**
Q.2. Minor experiment/ Flag labelling	**- 5 Marks**
Q.3. Spotters A,B,C,D,&E. Identification and notes (5X2)	**-10 Marks**
Record	**- 5 Marks**
	.....
	30 Marks
	.....

CONTINUOUS INTERNAL ASSESSMENT AND EVALUATION TECHNIQUES

COMMON TO CORE, ELECTIVE AND SKILL BASED SUBJECTS

INTERNAL ASSESSMENT : 25 Marks

Q.1. First Continuous Assessment Test

- 10

Q.2. Second Continuous Assessment Test

Q.3. Model Examination - 10

Q.4. Assignment /Seminar - 5

.....

25 Marks

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ALLIED ZOOLOGY PAPERS

INTERNAL ASSESMENT: 20Marks

Q.1. First Continuous Assessment Test

-8

Q.2. Second Continuous Assessment Test

Q.3. Model Examination -8

Q.4. Assignment /Seminar -4

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20 Marks

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VELLALAR COLLEGE FOR WOMEN (AUTONOMOUS), ERODE - 12.

CONTINUOUS INTERNAL ASSESSMENT FOR PRACTICALS IN ZOOLOGY

COMMON TO COREAND ELECTIVE PRACTICALS

INTERNAL ASSESSMENT: 40 Marks

Lab work	**-**	**20**
Test	**-**	**15**
Record work	**-**	**5**
		40 Marks

ALLIED PRACTCALS

INTERNAL ASSESSMENT : 20 Marks

Lab work	**-**	**10**
Test	**-**	**8**
Record work	**-**	**2**
		20 Marks

UGC SPONSORED CAREER ORIENTED PROGRAMME

BIOMEDICAL INSTRUMENTATION – CERTIFICATE COURSE

PAPER II -PATHOLOGY AND CLINICAL LABORATORY TECHNOLOGY

Instructional Hrs.: 100 **Sub. code : 13ABI22**

Max. Marks: CIA-25; ESE-75 **Credits: 6**

Objectives: 1.To study the instruments used in clinical laboratory.

2.To acquire knowledge in haematological techniques.

UNIT I **20 Hrs**

Prerequisites of a clinical laboratory: Maintenance of records and preparation of reports- Cleaning, maintenance and care of glass wares- *Safety precaution in the laboratory*- Sterilization – physical and chemical methods- Disposal of specimen and infected materials.

UNIT II **20 Hrs**

Laboratory Instruments: Description and uses of Microscope- Centrifuge- *Pressure cooker*- Haemoglobinometer- Albuminometer- Folin-Wu sugar tube.

UNIT III **20 Hrs**

Clinical Haematology: Collection of blood specimens - ABO grouping techniques - Rh grouping – Preparation of Haemin crystals. Haemoglobin estimation- Sahli's method. Clotting time and *Bleeding time.*

UNIT IV **20 Hrs**

Urine Analysis: Collection and preservation of urine for analysis- Physical examination of urine- Detection of glucose (Benedict's test)- *Detection of protein (Boiling test)*- Microscopic examination of organized and unorganized deposits of urine.

UNIT V **20 Hrs**

Faecal Examination: Physical and microscopic examination of faeces- Testing faeces for occult blood (Benzidine test). Laboratory diagnosis of the helminthes- Direct smear examination and

Sodium chloride. Examination for ova, cyst and adult Helminthes worms (Ascaris lumbricoides, Taenia solium).

Note: *Italics* denotes topics for self study.

TEXT BOOKS

1.**Sachdev K.N.,** *Clinical Pathology and Bacteriology,* Medical Publishers, New Delhi, 6th Edition, 1984.

2.**Samuel K.M.,** *Notes on Clinical Lab Techniques,* M.K.Gopalan, 3rd Edition, 1982.

REFERENCE BOOKS

1.**Kanai L. Mukherjee,** *Medical Laboratory Technology* Vol I & II , Tata McGraw Publishing Company Limited, New Delhi, 1988.

2.**Ramnik Sood,** *Haematology for Students and Practioners,* Medical Publishers, 4th Edition, 1996.

3.**Talib V.M.,** *A hand book of Medical Laboratory Technology*, CBS Publishers, New Delhi, 1988.

UGC SPONSORED CAREER ORIENTED PROGRAMME

BIOMEDICAL INSTRUMENTATION- DIPLOMA COURSE

PAPER IV- MEDICAL MICROBIOLOGY AND BIOCHEMISTRY

Instructional Hrs.: 100 **Sub.Code:13ABI44**

Max.Marks: CIA-25; ESE-75 **Credits: 6**

Objectives: 1. To understand the basic principles and applications of Microbiology.

2. To acquire knowledge in haemotological techniques.

UNIT I **20 Hrs.**

Bacteriology: ***Outline biology of bacteria- Bacterial culture- Hanging drop preparation and wet preparation-Staining methods – (Grams positive and Negative Staining).*** **Brief biology and pathology of Vibrio cholera.**

UNIT II **20 Hrs.**

Mycology: *Distinguishing characteristics of Fungi*. Laboratory Diagnosis of Mycotic Infections- histopathological studies, macroscopic examinations, microscopic examination by wet mount (direct examination of the specimen) and Laboratory culture. Diagnostic test for Mycotic Agent (Germ tube test). Superficial and cutaneous mycoses.

UNIT III **20 Hrs.**

Virology: General characteristics of Virus - Structure of Zoophage (HIV) and Bacteriophage (T_4)- Lytic and Lysogenic cycle of T_4 phage - Biology and pathology of Poliomyelitis virus and *Rhinovirus.*

UNIT IV **20 Hrs.**

Clinical Biochemistry: Estimation of blood glucose- Oral glucose tolerance test (OGTT) and glucose tolerance test (GTT) - Diagnosis of Triglycerides level in plasma- *Estimation of blood urea*- Estimation of Serum alkaline phosphatase.

UNIT V **20 Hrs**

Clinical Biochemistry: Total RBC count, Total WBC count and differential leucocyte count. Serological Investigation of VDRL test. Erythrocyte sedimentation rate.

Note: *Italics* denotes topics for self-study.

TEXT BOOKS

1.**Arumugam et.al.,** *Microbiology*, Saras Publication, Nagarcoil, 1996.

2.Samuel K.M., *Notes on Clinical Lab techniques*, M.K.Gopalan, 3rd Edition, 1982.

REFERENCE BOOKS

1.**Kanai L. Mukherjee,** *Medical Laboratory Technology Vol I & II*, Tata McGraw Publishing Company Limited, New Delhi, 1998.

2.**Purohit S.S.,** *A Text book of Microbiology*, Student Edition, 2004.

3.**Sachdev K.N.,** *Clinical Pathology and Bacteriology*, Medical Publishers, New Delhi, 6th Edition, 1984.

UGC SPONSERED CAREER ORIENTED PROGRAMME

BIOMEDICAL INSTRUMENTATION CERTIFICATE COURSE

PRACTICAL-I

Instructional Hrs.: 60 **Sub. code :13ABI2P**

Max. Marks: CIA-40; ESE-60 **Credits: 4**

1. ABO and Rh grouping
2. Haemoglobin Estimation
3. Bleeding time
4. Clotting time
5. Urine Albumin
6. Urine Glucose
7. Blood in urine
8. Microscopic examination of pus cell and cast cells
9. Sterilization techniques using Autoclave/Pressure cooker

SPOTTERS

1. Autoclave
2. Pressure cooker
3. Anti sera A & B
4. Haemoglobinometer
5. Albuminometer
6. Urinometer
7. Microscope
8. Centrifuge
9. Capillary tube
10. Folin Wu tube
11. Ascaris lumbricoides
12. Taenia solium

UGC SPONSORED CAREER ORIENTED PROGRAMME

BIOMEDICAL INSTRUMENTATION – DIPLOMA COURSE

PRACTICALS – II

Instructional Hrs.: 60 **Sub. Code: 13ABI4P**

Max. Marks: CIA-40; ESE-60 **Credits: 5**

1. RBC & WBC total count
2. WBC Differential count
3. Hanging drop preparation
4. Grams staining
5. Preparation of haemin crystals
6. Blood grouping in man
7. Immunodiagnosis using test kit -VDRL
8. Detection of glucose in blood
9. Preparation of nutrient agar broth

SPOTTERS:

1.ESR strand

2.VDRL kit

3.Cocci

4.Bacilli

5.Vibrio cholera

6.Poliomyelitis virus

7.Folin Wu sugar tube

8.Glucometer

Industrial Implant Training On

1. Electrocardiogram –ECG
2. Spectrophotometer and colorimeter
3. Sphygmomanometer –Blood pressure measurement
4. Glucometer - Blood sugar level measurement