

DEPARTMENT OF ZOOLOGY

B.SC. ZOOLOGY SYLLABUS

BATCH: 2020-2023

FACULTY MEMBERS

DR. S. SOMASUNDARAM M.SC.,B.ED.,PH.D.,P.G.MBT(HOD)

DR. M. DURAIRAJU, M. SC.,M.PHIL.,B.ED.,PGDGC.,PH.D.

DR. S. MARISELVI, M.SC.,M.PHIL.,PGDCA.,PH.D

MS. S. JAYALAKSHMI, M.SC.,M.PHIL., PH.D

DR. S. CHRISTOPHER, M.SC., B.ED., PH.D.,



NALLAMUTHU GOUNDER MAHALINGAM COLLEGE
(AN AUTONOMOUS INSTITUTION AFFILIATED TO BHARATHIAR UNIVERSITY)

RE- ACCREDITED BY NAAC

AN ISO 9001:2015 CERTIFIED INSTITUTION

POLLACHI - 642 001

COIMBATORE (DT.) TAMIL NADU

NALLANUTHU GOUNDER MAHALINGAM COLLEGE, POLLACHI

VISION

Our dream is to make the college an institution of excellence at the national level by imparting quality education of global standards to make students academically superior, socially committed, ethically strong, spiritually evolved and culturally rich citizens to contribute to the holistic development of the self and society.

MISSION

Training students to become role models in academic arena by strengthening infrastructure, upgrading curriculum, developing faculty, augmenting extension services and imparting quality education through an enlightened management and committed faculty who ensure knowledge transfer, instill research aptitude and infuse ethical and cultural values to transform students into disciplined citizens in order to improve quality of life.

DEPARTMENT OF ZOOLOGY

VISION

Enlightening the students with total dedication to bring out the hidden skills, creativity and human excellence with due emphasis on knowledge about recent development in the field of biology and mould them as responsible citizens.

MISSION

Metamorphosing the students holistically through seminars, symposia, guest lectures, group discussions, shared class experiences, assignments, nature club, job opportunities, and healthy practices to express the excellence within.

Scheme of Examination

Part No	Course Code	Course title	Lecture- Practical Hours/ week	Duration of Exam, Hrs	Max. Marks			Credit Point
					Internal	End-of- Semester	Total	
Semester I								
I	20UTL101	Tamil/Hindi Paper – I	6	3	25	75	100	3
II	20UEN101	English Paper – I	5	3	25	75	100	3
III	20UZY101	Core Major Paper –I Non-Chordata	7	3	25	75	100	4
		Major Practical – I (Non-Semester Pattern) Non-Chordata & Chordata	2	-	-	-	-	-
	20UBY1A1	Ancillary Zoology Paper–I Non-Chordata & Chordata	6	3	25	75	100	4
		Ancillary Zoology Practical (Paper I & II)	2	-	-	-	-	-
IV	20UHR101	Human Rights	1	2	-	50	50	2
	20HEC101	HE – (Personal values & SKY Yoga practice -I)	1	2	25	25	50	1
V		Extension activities (See Annexure - I)						
							500	17
Semester II								
I	20UTL202	Tamil/ Hindi Paper – II	6	3	25	75	100	3
II	20UEN202	English Paper – II	5	3	25	75	100	3
III	20UZY202	Core Major Paper –II Chordata	6	3	25	75	100	4
	20UZY203	Major Practical – I (Non-Semester Pattern) Non-Chordata & Chordata	2	3	40	60	100	4
	20UBY2A2	Ancillary Zoology Paper–II Economic Zoology	6	3	25	75	100	4
	20UBY2A3	Ancillary Zoology Practical (Non-Semester Pattern) Paper I & II	2	3	40	60	100	2
IV	20EVS201	Environmental Studies (EVS)	2	2	-	50	50	2
	20HEC202	HE – Family values SKY Yoga practice –II	1	2	25	25	50	1
V		Extension activities (See Annexure - I)						
							700	23

Semester III								
I	20UTL303	Tamil/ Hindi Paper - III	5	3	25	75	100	3
II	20UEN303	English Paper - III	6	3	25	75	100	3
III	20UZY304	Core Major Paper -IV Cell Biology	7	3	25	75	100	4
		Major Practical - II (Non-Semester Pattern) Cell biology & Genetics	2	1	-	-	-	3
	20UZY3A4	Ancillary Chemistry Paper - I	6	3	25	75	100	4
		Ancillary Chemistry Practical	2	1	1	1	1	3
IV	20UZY3N1 20UZY3N2	Non-Major Elective (NME) Public health and hygiene/ Ornamental fish culture/ Basic Tamil paper/ AD Tamil paper	1	2	-	50	50	2
V	20HEC303	HE - (Professional values & SKY Yoga practice-III) Extension activities (See Annexure -I)	1	2	25	25	50	1
							500	17
Semester IV								
I	20UTL404	Tamil/ Hindi Paper - IV	5	3	25	75	100	3
II	20UEN404	English Paper - IV	6	3	25	75	100	3
III	20UZY405	Core Major Paper -V Genetics	7	3	25	75	100	4
	20UZY406	Major Practical - II (Non-Semester Pattern) Cell biology & Genetics	2	1	40	60	100	4
	20UZY4A5	Ancillary Chemistry Paper - II	6	3	25	75	100	4
	20UZY4A6	Ancillary Chemistry Practical	2	1	40	60	100	2
IV	20UZY4N3 /20UZY4N4	Non-Major Elective (NME) Food and nutrition/ Apiculture/ Basic Tamil paper/AD Tamil paper	1	2	-	50	50	2
	20HRC404	HE - (Social values & SKY Yoga practice -IV)	1	2	25	25	50	1
V		Extension activities (See Annexure -I)				50	50	1
							750	24
Semester V								
III	20UZY507	Core Major Paper - VII Developmental Biology	5	3	25	75	100	4
	20UZY508	Core Major Paper - VIII Biotechnology	5	3	25	75	100	4
	20UZY509	Core Major Paper - IX Biostatistics & Biophysics	5	3	25	75	100	4
	20UZY510	Core Major Paper - X Bionformatics and Biochemistry	5	3	25	75	100	5
	20UZY5E1 20UZY5E2	Core Elective Paper - I & II Medical Laboratory Technique / Poultry Science And Management Technology	4	3	25	75	100	5

		Major Practical - III (Non-Semester Pattern) Developmental Biology, Animal Physiology & Endocrinology, Biostatistics & Biophysics, Bioinformatics & Biochemistry and MLT	2	-	-	-	-	-
		Major Practical - IV (Non-Semester Pattern) Ecology, Evolution, Biotechnology, Microbiology, Sericulture and Aquaculture	2	-	-	-	-	-
IV	20UZY551/ 20UZY552	Skill Based Elective (SBE)-Online Network and Information Security Cyber security – Ethical Hacking	1	2	-	50	50	2
	20GKL501	Skill Based Elective (SBE)-Online General Knowledge & General Awareness	SS	2	-	50	50	2
	20HEC505	HE - (National values & SKY Yoga practice-V)	1	2	25	25	50	1
							650	25
	Semester VI							
	20UZY611	Core Major Paper – XI Animal Physiology & Endocrinology	5	3	25	75	100	5
III	20UZY612	Core Major Paper – XII Ecology & Evolution	5	3	25	75	100	4
	20UZY613	Core Major Paper – XIII Microbiology & Immunology	5	3	25	75	100	4
	20UZY6E5/ 20UZY6E6	Core Elective Paper-III & IV Sericulture/ Insect Pest Management	4	3	25	75	100	3
	20UZY6E5/ 20UZY6E6/ 20UZY6E7	Core Elective Paper –V, VI & VII Aquaculture/ Dairy farming and management Technology/ Wildlife Conservation	5	3	25	75	100	5
	20UZY614	Major Practical – III (Non-Semester Pattern) Developmental Biology, Animal Physiology & Endocrinology, Biostatistics & Biophysics, Bioinformatics & Biochemistry & MLT	2	3	40	60	100	4
	20UZY615	Major Practical – IV (Non-Semester Pattern) Ecology, Evolution, Biotechnology, Microbiology, Sericulture and Aquaculture	2	3	40	60	100	4
IV	20UZY6S3	Skill Based Elective (SBE) Vermiculture	1	2	-	50	50	2
	20UZY6S4	Skill Based Elective (SBE) Biopharmaceuticals						
	20HEC606	HE - (Global values & SKY Yoga practice-VI)	1	2	25	25	50	1
							800	34

		**Grand total				3900	140
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Annexure – I: List of Part – V Subjects

S.No	Subject Code	Subjects
1	20 UNC 401	NCC
2	20 UNS 402	NSS
3	20 USG 403	Sports and Games
4	20 URO 404	Rotract Club
5	20 LRR 405	Red Ribbon Club
6	20 UYR 406	Youth Red Cross
7	20 UCA 407	Consumer Awareness Club
8	20 UED 408	Entrepreneurship Development Cell
9	20 UCR 409	Center for Rural Development
10	20 USS 410	Students Guild of Service
11	20 UGS 411	Green Society
12	20 UEO 412	Equal Opportunity Cell
13	20 UFA 413	Fine Arts Club

List of Part III Subjects (Core Elective Papers)

S.No	Subject Code	Subjects
1	20LZY5E1	Medical Laboratory Technique
2	20LZY5E2	Poultry Science And Management
3	20LZY6E3	Sericulture
4	20LZY6E4	Insect Pest Management
5	20LZY6E5	Aquaculture
6	20LZY6E6	Dairy farming and management

General Question Pattern PART-III & III

Max. Marks: 100	Internal: 30	External : 70	
Section	Pattern	Mark	Total
Part A	1-5 Multiple choice with 4 options (One question from each unit)	10X1	10
	6-10 Short answers (One question from each unit)		
Part B	11-15 Either /Or type (One question from each unit)	4X5	20
Part C	16-21 Four out of six (Question no. 16 is compulsory)	4X10	40
Total- 70			

Question Pattern for PART-IV

Max. Marks: 100	External : 50		
Section	Pattern	Mark	Total
Part A	1-5 Multiple choice with 4 options	5X1	5
	6-10 Short answers (One question from each unit)	5X1	5
Part B	Answer any questions five out of eight (11-18)	5X8	40
Total- 50			

CIA Test – I: 2.5 Units
 Test – II: Remaining 2.5 Units

Bloom's Taxonomy Based Assessment Pattern

K1-Remember : K2- Understanding , K3- Apply , K4-Analyse , K5- Evaluate

1. Theory: 75 Marks

(i) TEST- I & II and ESE:

Knowledge Level	Section	Marks	Description	Total
K1 & K2	A (Answer all)	10x1=10	MCQ/Define	75
K3	B (Either or pattern)	5x5=25	Short Answers	
K4	C (Answer 4 out of 6)	4x10=40	Descriptive/ Detailed	

2. Theory: 50 Marks

Knowledge Level	Section	Marks	Description	Total
K1	A (Answer all)	10x1=10	MCQ/Define	50
K2 & K3	B (Either or pattern)	5x 8=40	Detailed Answers	

3. Practical Examinations:

Knowledge Level	Section	Marks	Total
K3	Practical & Record work	60	100
K4		40	
K5			

Components of Continuous Assessment

Components	Calculation	CIA Total
Test 1	$\frac{75+75+25}{3}$	25
Test 2		
Assignment/Seminar		

Programme Outcomes

PO1: To obtain knowledge in taxonomic position of animals and know the morphology and anatomy of Non-Chordates and Chordates

PO2: The graduates can acquire knowledge along with the hands on experience in the life or job-oriented subjects like vermiculture, sericulture, apiculture, aquaculture, Medical laboratory techniques, microbiology, animal tissue culture, biotechnology etc.

Programme Specific Outcomes

PSO1	Impart awareness of the conservation of the biosphere.
PSO2	Understand the unity of life with the rich diversity of organisms and their ecological and evolutionary significance.
PSO3	To acquire knowledge in the ecological, economical and biological significance of the animals.
PSO4	To develop the awareness of health and hygiene for the society.
PSO5	To know the communicable, non-communicable, hereditary and major killer diseases.

Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Suresh Kumar	Dr. M. Durairaju	Dr. R. Muthukumar
Signature:	Signature:	Signature:

Programme code: B.Sc	Programme Title : Zoology		
Course Code: 2012Z101	Title: Core Paper – I Nonchordata	Batch : Semester	2020-2023 I
Hrs/Week: 7		Credits:	4

Course Objectives

- To understand the different animal groups under different phyla
- To know the Economic importance of **Nonchordata**
- To keep in mind the internal structure of Non-chordate organisms

Course Outcomes (CO)

K1	CO1	To remember the outline Classification of Nonchordata
K2	CO2	To understand the structure and inter-relationship between non-chordate animals.
K3	CO3	To deploy the each phylum with an example
K4	CO4	To discuss the general topics of each phylum

Unit	Content	Hrs
Unit I	• General characteristics of phylum Nonchordata • Outline Classification of Phylum up to class-level • Phylum Protozoa: Type study – <i>Paramecium caudatum</i> • Phylum Porifera Type study -<i>Leucosolenia</i> • Canal system in sponges	19Hrs
Unit II	• Phylum Coelenterata: Type study <i>Hydra Vulgaris</i> <i>Polymorphism in coelenteration</i> • Phylum Platyhelminthes: Type study - <i>Taenia solium</i> • Parasitic adaptations in Helminth worm (SS)	18Hrs
Unit III	• Phylum Aschelminthes: Type study <i>Ascaris lumbricoides</i> • Phylum Annelida Type study - <i>Nereis</i> • Metamerism in Annelids	18Hrs
Unit IV	• Phylum Arthropoda: Type study <i>Periplaneta americana</i> Arthropod Vectors and Human disease • Phylum Mollusca: Type Study <i>Pila globosa</i> <i>Economic importance of Mollusca (SS)</i>	18Hrs
Unit V	• Phylum Echinodermata - <i>Asterias rubens</i> • Larva forms of Echinoderms and their Significance	18Hrs
Total Contact Hrs		91Hrs

- Italics denoted as self study topics

Assignment, Seminar, Power point presentation, Google class room

Text Book:

1. Nair N.C., Leelavathy S., Soundarapandian N and Arumugam, N. (2019) A text book of Invertebrates – Saras Publication, Nagercoil.

Reference Book:

1. Ekambaranatha Iyer, (2016) A Manual of Zoology, Part I & II, Invertebrata, 5th edition Volume-I and II. S. Viswanathan(Printers and Publishers)
2. Kotpal R. Agarwal S.K& Khetarpal R.P. (2010) 10th Edition Modern Text Book of Zoology, Invertebrata, , Rastogi Publications.
3. Jordan E.L. & Verma I. K (1995) Invertebrate Zoology, S. Chand & Company, New Delhi.
4. Chauguly B.B Smita A & Adhikari S. (1977) 3rd Edition Biology of Animals, Vol. 1, Invertebrates New Central Book Agencies.
5. Dhama P.S & Dhama J K (1990) Invertebrate Zoology, S. Chand & Company – Removed latest version added

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		H	H	M	M	S
CO2		S	M	H	H	H
CO3		M	M	S	M	M
CO4		H	H	M	H	M

S-Strong, H-High, M-Medium, L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. S. Sornusundaram	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code: B-Sc	Programme Title : Zoology
Course Code: 2012/V/203	Batch : 2020-2021
	Major Practical -I
	Nonchordata and Chordata
Semester	I & II
Hrs/Week: 2	Credits: 4

Course Objectives

- To study the morphology and anatomy of Nonchordata and Chordata.
- To identify the organisms in field
- To create an awareness on biodiversity conservation

Course Outcomes (CO)

K3	CO1	To remember external and internal features of organisms
K4	CO2	To understand the unity of life with the rich diversity of organisms and their ecological and evolutionary significance
K5	CO3	To evaluate the conservation awareness of the biosphere by field visit

CONTENT

1. Identify the virtual Practical

1. **Nonchordata – Cockroach**

- External features of male
- External features of Female
- Digestive system
- Nervous system
- Male & Female Reproductive system

2. **Chordata – Frog**

- External
- Digestive system
- Heart
- Brain
- Limbs
- Male & Female Urino-genital system

2. SPOTTERS

A. Classify giving reasons:

- 1) Plasmodium
- 2) Leucosolenia
- 3) Obelia colony
- 4) Fasciola hepatica
- 5) Earthworm
- 6) Freshwater mussel
- 7) Sea Cucumber
- 8) Tilapia
- 9) Varanus
- 10) owl
- 11) Pig

B. Draw labeled sketch:

- 1) L.S of Leucosolenia
- 2) Obelia Medusa
- 3) T.S of Taenia solium
- 4) T.S of Earthworm
- 5) Cockroach- Mouth parts
- 6) Placoid scale
- 7) Frog – Pectoral and pelvic girdle
- 8) Pigeon – Synsacrum and flight muscle
- 9) Rabbit Beams

C. Biological significance:

- 1) Corals and Coral reefs

2) Peripatus
3) Limulus
4) Bipinnaria Larva
5) Balanoglossus
6) Amphioxus
7) Salamander
8) Archaeopteryx
9) Bat
10) Axolotl larva
11) Hyla
12) Chamaeleon
D. Write descriptive notes:
1) <i>Taenia solium</i> – Scolex
2) Earth worm - setae
3) <i>Penaeus</i> appendages
4) Pila – Radula
5) Sea borse
6) <i>Scorpa</i>
7) Rhacophorus
8) Draco
9) Cobra
10) <i>Platypus</i>
11) Monotremes - Echidna
12) Marsupials – Kangaroo
3. Field Visit/Project (Select A or B option)
The Student field visit and report submission along with the record.
A. Individual activity
Identification of invertebrate and vertebrate species available in campus/field without disturbing the natural habitat.
Field/project/turn report and photographs to be submitted.
B. Group Activity
A maximum of three students can choose any one group of activity any matter of zoological interest and submit the report for external practical examination.
Viva
Experiences of field visit and report preparation should be present.
4. Record
Total Contact Hrs
52

Experience: Discussion, activity, Field visit, Report Preparation, Hands on experience in practicals

Mark Distribution:

Total Marks	Internal(CIA)	Marks	End of semester Practical Examination (ESE)	Marks
100	Practical Skill/observation	10	Experiments	20
			Virtual dissection – Non Chordata	
			Virtual Dissection -Chordata	
	Model Practical Examination	20	Spotters	20
			Field Visit Report Submission- Fauna in our area	10
	Record work	10	Record	10
	Total Marks	40	Total Marks	60

Books for Reference:

1. Lal, S. S. (2004) A text book of Practical Zoology Invertebrate. Rastogi Publications, Shivaji Road, Meerut, India 250 002
2. Lal, S. S. (2004) A text book of Practical Zoology Vertebrate. Rastogi Publications, Shivaji Road, Meerut, 250 002, India
3. www.froguts.com
4. www.scienceclass.com
5. www.ertn.vt.edu
6. www.petaindia.com
7. www.digi.frog.com

CO	PSO	Mapping				
		PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	H	H	H	M	H
	CO2	H	M	M	H	M
	CO3	M	M	M	H	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature		Verified by HOD Name and Signature		Checked by CDC		Approved by COE	
Ms. S. Jayalakshmi		Dr. S. Somasundaram		Dr. M. Durairaju		Dr. R. Muthakumaran	
Signature:		Signature:		Signature:		Signature:	

Programme code:	B. Sc	Programme Title :	Zoology		
Course Code:	20UBVLA1	Title	Batch :	2020-2023	
		Ancillary Zoology Paper – I Nonchordata and Chordata	Semester	1	
Hrs/Week:	6		Credits:	4	

Course Objectives

- To study the structure and classification of different Phylum
- To understand the general characters of Chordata and Nonchordata
- To understand the about the different biological systems

Course Outcomes (CO)

K1	CO1	To remember animal external characters and its kingdom wise classification
K2	CO2	To comprehend animal systems and its peculiar characters
K3	CO3	To execute animal general characters and classification strategies
K4	CO4	To sort of animal classification system and its importance

Unit	Content	Hrs
Unit-I	Outline Classification of Phylum up to the class level • Phylum Protozoa: Paramecium – Structure - Binary fission and Conjugation. • Phylum Coelenterata: Obelia – Structure and Life cycle	16Hrs
Unit- II	• Phylum Platyhelminthes: <i>Taenia solium</i> – Structure - Reproduction and Life cycle. • Phylum Arthropoda: <i>Centropus</i> – Structure: Mouthparts, Digestive system, Nervous system and Reproductive system.	16Hrs
Unit- III	• Phylum Mollusca: Freshwater mussel – Structure – Digestive system- Respiratory system – Reproductive system • Phylum Echinodermata: Sea star – Structure and Water Vascular system	16Hrs
Unit -IV	• Phylum Chordata • Sub Phylum Prochordata – General Characters of ○ Amphioxus ○ Balanoglossus ○ Ascidian • Sub Phylum Vertebrata Class : Pisces - Shark - External structure – Digestive & Urinogenital systems • Class Amphibia: Frog - structure - Respiratory system - Heart - Reproductive system	15Hrs
Unit-V	• Class Reptilia: Chelon - structure - Circulatory system - Reproductive system • Class Aves: Pigeon - structure - Flight muscles - Digestive system - Respiratory system • Class Mammal: Rabbit - structure - Heart - Reproductive system	15Hrs
Total Contact Hrs		78

- *Hdies devoted as self study topics*

Power point Presentations, Group discussions, Seminar, Assignment, Discussion, Google class room

Book for Study:

1. Arumugan N. (2019) Allied Zoology Part I & Part – II – Sarva Publications, 114/25 G. A.R.P. Camp Road, Peravallur, Kottar PO, Nagercoil -629 002, Kanyakumari
2. R.L.Kotpal (10th Edt. 2012), Modern text book of Invertebrates, Rastogi Publications, Meerut

Books for Reference:

1. Elumjaramanthy Iyer (1995) A Manual of Zoology Vol. I & II, Ananda Book Depot

"Acton Lodge", Mc Nichols Road, Chetput, Madras – 600 031

- Jordan E.L. & Verma J.K. (1997) Invertebrate Zoology, S. Chand & Company Ltd, Ram Nagar, New Delhi 110055
- Dhami P.S & Dhami J.K. (1995) Invertebrate Zoology, S. Chand & Company
- Ganguly B.B. Sinha, A & Adhikari S. (1977) 3rd Edition Biology of Animals, Vol. –I, Invertebrates, New Central Book Agencies.
- Kotpal R.L. (1983) Modern Text Book of Zoology, Rastogi Publications Meerut
- Nigam Shoban I Naginhand H.C. (1995) Biology of Non-Chordates, Shoban I Nagin hand & Co Educational & Publishers.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Christobher	Dr. S. Somantharam	Dr. M. Duramaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc.	Programme Title :	Zoology
Course Code:	20UBV2A3	Title	Batch :
		Ancillary Zoology Practical – (Paper I & II)	2020-2023 I& II

Hrs/Week:	2	Credits:	2
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Course Objectives

- To study the morphology and anatomy of invertebrate and vertebrate
- To study the ecological and biological significance of the animals
- To get the knowledge on biological systems through virtual dissection

Course Outcomes (CO)

K3	CO1	To remember the anatomical and morphological structure of animals and micro organisms
K4	CO2	To understand the ecological and biological importance of vertebrates and invertebrates
K5	CO3	To validate the practical efficiency in the animal kingdom structure and function

CONTENT

1. Identifying the virtual specimen exposed in monitor /dissect the virtual specimen and label it and comment on it with suitable diagram

1. NonChordata – Cockroach

- External features Male
- External features Female
- Mouth Parts of Cockroach
- Digestive system
- Nervous system
- Male Reproductive system
- Female Reproductive system

2. Chordata – Frog

- External
- Digestive system
- Heart
- Brain
- Limbs
- Male Urinogenital system
- Female Urinogenital system

2. SPOTTERS

A. Classify giving reasons:

- 1) Paramecium
- 2) Obelia colony
- 3) Penaeus
- 4) Star Fish
- 5) Amphioxus
- 6) Calotes
- 7) Pigeon
- 8) Rabbit

B. Draw labeled sketch:

- 1) Leucosolenia
- 2) Taenia solium – Scolex
- 3) Frog – Pectoral girdle
- 4) Calotes – Brain
- 5) Naja Naja
- 6) Pigeon – Flight Muscle
- 7) Rabbit – Dentition
- 8) Human – Digestive system

C. Biological significance:

- 1) Obelia Medusa
- 2) Balanoglossus
- 3) Honey bee
- 4) Mosquito
- 5) Earthworm
- 6) Salamander

7) Silkworm
8) Kangaroo
D. Write descriptive notes:
1) Paramecium - Conjugation
2) Gold fish
3) Sea horse
4) Tortoise
5) Owl
6) Bat
7) Peripatus
8) Silk gland of Silkworm
3. Insect Collection
4. Record
Total Contact Hrs
52

Experience Discussion, Activity, Case study, Hands on experience in practicals
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Mark Distribution:

Total Marks	Internal(CIA)	Marks	End of semester Practical Examination (ESE)	Marks
100	Practical Skill/observation	10	Experiments Virtual dissection - Non Chordata Virtual Dissection -Chordata Spotters	20
	Model Practical Examination	20	Field Visit Report Submission- Faunal diversity Insect Collection	10
	Record work	10	Record	10
	Total Marks	40	Total Marks	60

Reference:

1. Arumugam, N. (2018). Practical Zoology Invertebrate Volume-I First edition. Saras publication, Nagarcoil, Kanyakumari
2. Arumugam, N. (2018). Practical Zoology Chordata Volume-II First edition. Saras publication, Nagarcoil, Kanyakumari (remove)
3. www.froguts.com
4. www.scienceclass.com
5. www.cpto.vt.edu
6. www.petaindia.com
7. www.digitfrog.com

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H

CO3	M	S	S	M	M
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S-Strong; H-High; M-Medium; L-Low

Course Designed by		Verified by HOD		Checked by		Approved by	
Name and Signature		Name and Signature		CDC		COE	
Dr. S. Christobher		Dr. S. Somasundaram		Dr. M. Durairaju		Dr. R. Muthukumaran	
Signature:		Signature:		Signature:		Signature:	
Programme code:		B. Sc		Programme Title :		Zoology	
Course Code:		20UZY202		Title Core Paper – II Chordata		Batch : Semester 2020-2023 II	
Hrs/Week:		6				Credits: 4	

Course Objectives

- To acquire a basic knowledge of chordates
- To know the knowledge about the animal behaviours
- To understand the animals inter- relationships

Course Outcomes (CO)

K1	CO1	To keep in mind the outline Classification of Chordata
K2	CO2	To understand the morphology and anatomy of vertebrates
K3	CO3	To execute interrelationship between Each class
K4	CO4	To discuss the biodiversity of chordates.

Unit	Content	Hrs
Unit I	General characters and outline classification of Phylum Chordata up to class level a) Amphioxus. b) Balanoglossus c) Ascidian • Class: Pisces Type study – Shark – Respiratory system <i>Reproductive system</i> <i>Parental care in Fishes</i>	16Hrs
Unit II	• Class: Amphibia Type study – Frog- External – Girdles and Limbs – Respiratory system – Heart Brain – Urino-genital system > Parental care in Amphibia.	16Hrs
Unit III	• Class: Reptilia Type study – Calotes-External – Digestive system – Brain- Excretory system- Reproductive system > <i>Poisonous and Non-poisonous snakes.</i> > Poison apparatus and biting mechanism in Snakes –	16Hrs
Unit IV	Class Aves Type study: <i>Columba livia</i> <i>Flight adaptation & Migration of Bird</i>	15Hrs
Unit V	• Class: Mammalia Type study – Rabbit > Salient features of Protheria – Metatheria – Eutheria.	15Hrs
Total Contact Hrs		78 Hrs

➤ *Topics denoted as self study topics*

Power point Presentations, Group discussions, Seminar, Assignment, Google class room :-

Book for Study:

1. Thangamani, A., Prasanna kumar, S., Narayanan, L.M., and Arumugam, N., (2019) (10th edition) A text book of Chordata. Saras publications, 114/35 G. A.R.P Camp Road, Peruvillur, Kottar PO, Nagercoil -629 002, Kanyakumari
2. R.L.Kotpal (3rd Edn, 2012), Modern text book of Invertebrates, Rastogi Publications, Meerut

Books for Reference:

1. Ekanatharaman Iyer, (2008) Manual of Zoology, Vol II (6th Edition), S.Viswanathan PVT Ltd., Parts I & II, Viswanathan & Co.
2. Jordan, E.L. and Verma, P.S. (2006) Chordate Zoology, S. Chand & Company LTD., Ram Nagar, New Delhi -110055

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	H	S	M	H	H
	CO2	M	M	H	H	M
	CO3	S	H	S	M	M
	CO4	M	M	H	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature Ms. S. Jayalakshmi Signature:	Verified by HOD Name and Signature Dr. S. Somasundaram Signature:	Checked by CDC Dr. M. Durairaju Signature:	Approved by COE Dr. R. Muthukumaran Signature:
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Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	20UBY2A2	Title	Batch :	2019-2022
		Ancillary Zoology Paper – II Economic Zoology	Semester	II
Hrs/Week:	6		Credits:	4

Course Objectives

- To understand the applications of Zoology.
- To study the ecological and economic aspects of beekeeping, silkworm rearing, poultry keeping, dairy farming and aquaculture

- To study the importance of organic farming.

Course Outcomes (CO)

K1	CO1	To remember zoological application in day to day life.
K2	CO2	To get the idea of ecological and economical application of modern zoology
K3	CO3	To apply zoological knowledge in self employment and functional ecology
K4	CO4	To sort of technical, ecological and economical knowledge in the zoology

Unit	Content	Hrs
Unit-I	AQUACULTURE • Scope of Aquaculture • Types of Fisheries 1. Inland fisheries & Marine fisheries • Cultivable organisms 1. Fil fishes 2. Fishes diseases Bacterial viral and Fungal disease - o Bacteria - Erythroderma , Bacterial Gill Rot - o Virus : EUS,IPN - o Fungal – Saprolegniasis • Oyster culture 1. Edible oyster & Pearl oyster	16Hrs
Unit-II	APICULTURE • Scope of Apiculture • Races of <i>A. indica</i>, <i>A. mellifera</i> and <i>A. dorsata</i> • Products of Bee Keeping - Royal jelly, Honey , Wax and Bee venom DAIRY FARMING • Scope of dairy farming • A typical dairy farm. • Dairy animals Cow • Live stock diseases 1. Mastitis & Foot and Mouth disease(FMD) • <i>Nutritive value of milk</i> Dairy By-products	16Hrs
Unit-III	SERICULTURE • Scope of Sericulture • Optimum conditions for mulberry growth • vegetative propagation • Structure of silkworm and Silk gland • Life cycle of <i>Bombyx mori</i> • Rearing appliances • Disinfection • Diseases of silkworms 1. Pebrine 2. Viral flacherie • Cocoon market	16Hrs
Unit-IV	POULTRY KEEPING • Scope of poultry • Construction of poultry house • Rearing of Broilers and Layers • Diseases of poultry	15Hrs

	1. Fowl pox 2. Coccidiosis 3. Ranikhet disease 4. Bird Flu • <i>Nutritive value of Egg</i>	
Unit -V	VERMICULTURE • Scope of Vermiculture • Classification of Earthworm based on habitat • Collections of earthworm • Preparation of vermifed • Proedure and maintainance indoor vermicompost • Vermiwash • Packaging of Vermicompost and its marketing	15Hrs
Total Contact Hrs		78

➤ *Italic denoted as self study topic*

Power point Presentations, Seminar , Assignment, Discussion, Case study, Google class room

Book for Study:

1. Arumugam, N. (2018) Applied Zoology, Saras Publication, 114/35 G ARP Camp Road, Peravilai, Nagercoil, Kanyakumari – 629 002

Books for Reference:

1. Ojha and Satochani Chetty, (1999) An introduction to aquaculture, 1st Edition, Oxford & IBH Publishing Co. Pvt Ltd New Delhi
2. Arumugam, N.(2013) Economic Zoology, 1st edition, Saras Publication, 114/35 G ARP Camp Road, Peravilai, Nagercoil, Kanyakumari – 629 002
3. Shukla & Upadhyay,(2001) Economic Zoology - Rastogi Publication, Shivaji Road, Meerut 250 002
4. Arumugam, N. (2012) Aquaculture - 1st edition, Saras Publication, 114/35 G ARP Camp Road, Peravilai, Nagercoil, Kanyakumari – 629 002
5. Fathi, N. & Thirumathal, K. (2008) A hand book for sericulture, Shrishti Impression, Coimbatore
6. Tripathy, S.N. (2004) Food biotechnology, Douranant Publishing and distributions, New Delhi 110 002.
7. Tarul Kumar Banerjee (2017), Applied Zoology, New central book agency pvt. ltd. Kolkata

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature		Verified by HOD Name and Signature		Checked by CDC		Approved by COE	
Dr. S. Christobher		Dr. S. Somanandaram		Dr.M.Darairaju		Dr.R.Muthukumaran	
Signature:		Signature:		Signature:		Signature:	
Programme code:	B. Sc	Programme Title :		Zoology			
Course Code:	20EVS201	Title		Batch :		2020-2023	
		Environmental Studies (EVS)		Semester		II	
Hrs/Week:	2			Credits:		2	

Course Objectives

- To know the basic concepts of Environment
- To get the knowledge about the maintenance of pollution free ecosystem.
- To acquire knowledge about the environmental legislations

Course Outcomes (CO)

K1	CO1	To create an awareness about the Environment
K2	CO2	To get the idea on Environment conservation and management.
K3	CO3	To execute the pollution free environment in future perspectives.
K4	CO4	To evaluate the value of Natural Resources

Unit	Content	Hrs
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Unit I	1 The Multidisciplinary nature of Environmental Studies: • Introduction. • Scope of Environmental Studies. • Need for Public Awareness 2 Natural Resources: • Types of Natural Resources • Natural resources and associated problems a. Forest resources b. Water resources c. Mineral resources d. Food resources e. <i>Energy resources*</i> • Role of an individual in conservation of natural resources • case studies	5Hrs
Unit II	3. Ecosystems: • Concept of an ecosystem • Structure and function of an ecosystem • Energy flow in the ecosystem • Ecological succession • Structure and functions of a) Aquatic ecosystems b) Terrestrial ecosystems 4. Biodiversity and its conservation: • Introduction • Genetic diversion • Species diversion • Value of Biodiversity • Hot – Spots of Biodiversity • Threats to biodiversity • Endangered and Endemic Species of India • Conservation of biodiversity	5Hrs
Unit III	5. Environmental Pollution: • Causes, effects and control measures of a. Air Pollution b. Water pollution c. Soil pollution d. <i>Noise pollution *</i> e. Thermal pollution f. Radioactive pollution • Pollution case studies 6 Solid waste management: • Causes, effects and control measures • Role of individual in prevention of pollution	6Hrs
Unit IV	7. Disaster management: Floods, Earthquake, Cyclone and Landslides 8 Social issues and environment: • Sustainable Development • Urban problems related to energy • <i>Rainwater harvesting *</i> • Environmental Ethics • Global warming	5Hrs
Unit V	9. Environmental Legislations and Acts: /	5Hrs

	a. Environment (Protection) Act b. Air (prevention and control of pollution) Act c. Water (Prevention and control of pollution) Act d. Wildlife protection Act e. Forest conservation Act 10. Human Population and Environment: • Population growth and explosion • Environment and Human health • Value education • Role of Information Technology in Environment and Human health	
Total Contact Hrs		26

➤ *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Group discussions, Case study.

Field work:

- Visit to local area to document environmental assets (river / forest / Grassland / Mountain)
- Visit to a local polluted site - urban / rural / industrial / agricultural

Text Book:

1. N Arunagani, M.Duraiaraju and V.Kumaresan (2018 Reprint) - Environmental Studies

Books for Reference:

1. Odum E. P. (1971) 1st edition. Fundamentals of ecology. W. B. Saunders Company, London
2. Verma and Agarwal. (2003) 5th edition. Principles of Ecology. S. Chand & Company, Ltd. New Delhi. 110655
3. Agarwal, K.C. (2001) Environmental Biology, Nidi Publ. Ltd. Bikaner
4. Bhargava Erach, (2006) The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad -13, India, Email: mapin@greenet.net, ISBN-10: 1890206407
5. Clark R.S., (2001) 5th Edition. Text book in Marine Pollution, Clarendon Press Oxford (TB).
6. Cunningham, W.P., Cooper, T.H., Gorbani, E. & Hepworth, M.T. (2001) Environmental Encyclopedia. Jaico Publ. House, Mumbai. 1196p

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	M	H	H	H
CO3	M	S	S	M	M
CO4	M	H	H	H	H

S-Strong, H-High, M-Medium, L-Low

Compiled By
Dr. M.Duraiaraju M.Sc., M.Phil., B.Ed., PGDGC, Ph.D.

Associate Professor and Head, Department of Zoology
 Co-ordinator, Curriculum Development Cell (CDC)
 NGM College, Pollachi – 642 001

Course Teacher Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Mariselvi Signature:	Dr. S. Somasundaram Signature:	Dr.M.Duraiaraju Signature:	Dr.R.Muthukumaran Signature:

Programme code:	B Sc	Programme Title :	Zoology	
Course Code:	20BZY304	Title	Batch :	2020-2023
		Core Paper – IV	Semester	III
Hrs/Week:	7	Cell Biology	Credits:	4

Course Objectives

- To study the basic concepts of Cell
- To acquire the basic knowledge on development in Cell
- To understand the techniques in cytology.

Course Outcomes (CO)

K1	CO1	To remember the overview of cells and their origin and evolution.
K2	CO2	To get the fundamental ideas of prokaryotic and eukaryotic cell
K3	CO3	To deploy the structure and functions of cell organelles.
K4	CO4	To sort of cell constituents and their biological activities.

Unit	Content	Hrs
Unit I	• Scope of Cell Biology • Cell Theory □ Protoplasm theory □ Germplasm theory □ Organismal theory • Cytological techniques: □ Fixation, Dehydration, Embedding, Sectioning, Staining and Mounting • Prokaryotic Cell & Eukaryotic Cell	19Hrs
Unit II	• Organelles: Plasma membrane Structure – Eukaryotic model - Bimolecular leaflet model and Fluid mosaic model & functions of plasma membrane. • Endoplasmic Reticulum Ultra Structure – Rough and Smooth types - Functions • Ribosomes: Types – Chemical composition – Biogenesis of 70s – Function • Golgi complex: Structure and Functions	18Hrs
Unit III	• Lysosomes: Polymorphism and Functions • Mitochondria: Structure functions. • Nucleus: Ultra structure and function • Nucleolus: Ultra structure and function	18Hrs
Unit IV	• Centrosomes: Structure and functions • Chromosomes: Structure – Types – Giant chromosomes – Polytene and Lampbrush • Nucleic acids □ DNA Structure, Replication of DNA (Semi-conservative model) □ Types of RNA • Protein synthesis □ Central dogma and Central dogma reverse □ Mechanism of protein synthesis	18Hrs
Unit V	• Genetic Code – Salient features • Cell division □ Cell cycle □ Amitosis, Mitosis and Meiosis... • Cell signaling: □ Characteristics & Cell Transduction Pathways • Cancer cells	18Hrs

	c. Characteristic and Types c. Oncogenes Cell aging - Causes - Changes and Apoptosis(SS)	
Total Contact Hrs		91

➤ *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment,

Book for Study:

1. Arumugam N. (2018) Cell Biology – Saras Publication, J14/35 G, A R P Camp Road, Periyavilai, Kottar PO, Nagercoil -629 002, Kanyakumari
2. Verma P.S. and Agarwal V.K. (2006) Cell Biology – Genetics, Molecular Biology, Evolution and Ecology- S.Chand and Company LTD: Ram Nagar, New Delhi -110055

Reference:

1. Verma P.S. and Agarwal V.K. (1993) Cytology- S.Chand & Company LTD, Ram Nagar, New Delhi -110055
2. Singh & Tomar, (2008) 9th revised edition Cell Biology –Rastogi Publications, Shivaji road, Meerut –250 002, India
3. E.D.P. De Robertis and E.M.F. De Robertis Jr - Cell and Molecular Biology – 8th Edition, Lippincott Williams and Williams Publishers
4. Anind Islam (Reprint 2019)- Essentials of Cell biology. Books and Allied Pvt.Ltd, Kolkata
5. Singh and Tumar -10th Rev.Ed (2012) Cell Biology – Rastogi Publications, Shivaji Road, Meerut
6. C.P.Pawar (2018) Cell Biology – Himalaya Publishing House, Mumbai
7. Ajay Paul (2018) A Text Book of Cell and Molecular Biology, Books and Allied Pvt.Ltd, Kolkata

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	M
CO2	H	M	H	M	H
CO3	M	H	H	M	M
CO4	M	H	H	M	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Dr. S. Mariselvi	Dr. S. Somasundaram	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	ZOOZY406	Title	Batch : 2020-2023
		Major Practical – II	Semester III & IV
		Cell Biology and Genetics	
Hrs/Week:	2	Credits:	4

Course Objectives

- To know the measurements of microscopic objects.
- To acquire the knowledge in blood grouping.
- To understand the basic concepts in genetics through experiments.

Course Outcomes (CO)

K3	CO1	To keep in mind for identify the different stages of mitosis.
K4	CO2	To understand the concepts of genetics through experiments.
K5	CO3	To access the practical experience in instrument handling.

Syllabus

Content	Hrs
EXPERIMENTS • Measurements of cell using - Stage Micrometer and Ocular Micrometer • Squash preparation from Onion Root tip • Identification of squamous epithelial cells in buccal smear. • Human Traits survey and gene frequency calculations. • ABO Blood grouping in man • Probability Test – Two coin tossing experiment. • Law of Segregation – Using color beads. • Law of Independent Assortment – Using color beads. SPOTTERS: CELL BIOLOGY 1. Human Immunodeficiency Virus 2. <i>E. coli</i> Bacterium 3. A typical animal cell 4. Interphase Nucleus 5. Lamp brush chromosome 6. Polytene Chromosome 7. Mitosis - Stages 8. Meiosis - Stages 9. DNA - Watson & Crick Model 10. Cancer cells 11. Structure of tRNA GENETICS 1. Drosophila – Male and Female 2. Gynandromorph 3. Hairy Pinna 4. Erythroblastosis foetalis 5. Klinefelter's syndrome 6. Down's syndrome 7. Turner's syndrome 8. Twins 9. Free – martin cattle 10. Sickle cell anemia 11. Albinism	

12. Pedigree analysis	
Record	
Total Contact Hrs	52

Practical Experience, Activity

Mark Distribution:

Total Marks	Internal(CIA)	Marks	End of semester Practical Examination (ESE)	Marks
100	Practical Skill/observation	10	Experiments	
			Major practical	20
			Minor Practical	10
	Model Practical Examination	20	Spotters	20
	Record work	10	Record	10
	Total Marks	40	Total Marks	60

Books for Reference

1. Jaysura and Arumugam, N (2013) Practical Zoology Vol.3 Saras Publication, Nagarcovil, Tamil Nadu.
2. Jaysura and Arumugam, N (2017) Practical Zoology Vol.3 Saras Publication, Nagarcovil, Tamil Nadu.
3. Lal, S. S. (2008). A text book of Practical Zoology, Rastogi Publications, Shivaji Road, Meerut
4. Mohan, P. Arora (2011) An Introduction to Genetics, Vol.I (Theory and Practical), Himalaya Publishing House.
5. J. Sinha, A.K. Chatterjee, P. Chittopadhyay (2011) Advanced Practical Zoology, Books and Allied Company, Kolkata.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	H	H
CO2	H	M	H	M	H
CO3	M	M	M	M	M

S-Strong, H-High, M-Medium, L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Maniselvi	Dr. S. Somasundaram	Dr. M. Durairaju	Dr. R. Muthukrishnan
Signature:	Signature:	Signature:	Signature:

Programme code:	B Sc	Programme Title :	Zoology
Course Code:	ZHUZY3N3	Title Public Health and Hygiene Non-Major Elective (NME)	Batch : 2020-2021 Semester III
Hrs/Week:	1	Credits:	2

Course Objectives

- To study the importance of health and hygiene for the society.
- To know about prevent from diseases
- To keep in mind the maintenance of our body

Course Outcomes (CO)

K1	CO1	To remember the Health awareness.
K2	CO2	To understand the communicable and non-communicable diseases.
K3	CO3	To implement the Pollution free environment.
K4	CO4	To discuss the importance of nutrition

Unit	Content	Hrs
Unit I	• Introduction to public health • Health indicators <i>Personal hygiene, Public health</i> • Health Dynamics of disease transmission <i>eg. Malaria</i> – host, vectors and environment	3Hrs
Unit II	• Concepts of Health and diseases. • Nutrition and Health Classification of food (Macro & Micro nutrients) • Nutritional deficiencies Vitamin and Mineral deficiencies • Balanced diet	3Hrs
Unit III	• Blood borne diseases – Hepatitis B and Hepatitis C • Kidney stone • Liquid deficiency diseases • Protein deficiency diseases	2Hrs
Unit IV	• Communicable diseases Measles, Cholera, Amoebiasis, <i>Infantile</i>, <i>Chicken pox</i> - AIDS • Non-Communicable Diseases Coronary heart Disease, Diabetes, Obesity, Stroke and Cancer	2Hrs
Unit V	• Health Education Health care services in India Health Planning and Programmes in India Role of World Health Organization (WHO) in health education • First Aid and Nursing Methods, Dressing, Care & Duties.	3Hrs
Total Contact Hrs		13

➤ *Italics denoted as self study topics*

Assignment, Seminar, power point

Book for study

- 1). Park and Park (1995) Text book of Preventive and Socio Medicine. M/S. Baparsulab Bhanot Publishers, Jabalpur

Books for Reference:

- 1) Verma S. (1998) Medical Zoology. Rastogi Publications, New Delhi
- 2) Jordon, E.L. and Verma. P.S. (1995) Invertebrate Zoology. 12th edn. Sultan Chand & Co

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	H	S	H	H	S
	CO2	H	H	H	S	H
	CO3	H	S	S	M	H
	CO4	S	H	H	H	S

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. S. Somasundaram	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	20UZVT02	Title	Batch : 2020-2023
		Ornamental Fish Culture Non-Major Elective (NME)	Semester III
Hrs/Week:	1		Credits: 2

Course Objectives

- To study the various ornamental fishes and its culture
- To understand the morphology and physiology of different fishes
- To know about the aquarium construction

Course Outcomes (CO)

K1	CO1	To recollect the general ornamental fishes
K2	CO2	To understand the scope of fish culture
K3	CO3	To apply the ornamental fish culture methods for aquarium maintenance
K4	CO4	To review the different types of cultural methods

Unit	Content	Hrs
Unit I	• Scope of ornamental fish culture • General characteristic of fish • General structure of fish ◦ Digestive system ◊ Reproductive system	3Hrs
Unit II	• Materials, equipment required for aquarium • Construction of home aquarium • Structure and location of home aquarium	3Hrs
Unit III	• Selection of fish for home aquarium • Common aquarium fishes	2Hrs
Unit IV	• Fish feed • Natural fish feed • Artificial fish feed • Maintenance of home aquarium	2Hrs
Unit V	• Common disease of ornamental fishes • Fish parasites and control • Bioremedies for fish disease • Ornamental fish breeding- cum rearing unit for entrepreneurs	3Hrs
Total Contact Hrs		13

➤ *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Google class room

Book for Study:

1. Arumugam, N. (2018) Aquaculture SARAS Publications, Nagercoil, Tamilnadu

Books for Reference:

1. Dhote, A.K. (1989) Publication Department - NCERT - 55 Inland fishery - Instructional - cum - Practical - Manual Vol IV Aquaculture
2. Agarwal, S.C (1994) A hand book of fish farming, B.I Enterprises, New Delhi.
3. Biswas, K.P (1996) A Text book of fish & Fisheries Technology - Calcutta (W.B) 2nd Edition, Published by Narendra Publishing house, Delhi

4. Jhingran, V. G. (1988) Fish and Fisheries of India - Hindustan Publishing Corporation (India) Delhi, Printed in India at Gopsons papers Pvt Ltd, Noida

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	M	H

S-Strong, H-High, M-Medium, L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Christobher	Dr. S. Somasundaram	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	2012Y405	Title	Batch : 2020-2021
		Core Paper – V	Semester IV
		Genetics	
Hrs/Week:	7	Credits:	4

Course Objectives

- To Study the basic concepts of hereditary and variations
- To understand the basic Mendel's Laws
- To acquire knowledge of hereditary diseases.

Course Outcomes (CO)

K1	CO1	To keep in mind the genetic disorders in man
K2	CO2	To understand the chemical basis of heredity
K3	CO3	To deploy the heritable traits in families and populations
K4	CO4	To sort of genetic concepts including health and diseases

Existing Syllabus

Unit	Content	Hrs
Unit I	• Mendel's monohybrid and dihybrid experiments • Mendel's Laws • Interaction of genes ◊ Lethal genes and its types ◊ Epistasis • Polygenic inheritance: Skin colour in man 1:4:6:4:1 • Multiple alleles ◊ Coat colour in Rabbit ◊ ABO blood groups in man ◊ Rh factor	19Hrs
Unit II	• Linkage ◊ Complete and incomplete linkage • Chromosome maps: ◊ Chromosome map in Drosophila • Sex determination: ◊ Homogametic ◊ Heterogametic ◊ Hymenopterous type - Honey bee ◊ Gynandromorph - Drosophila melanogaster ◊ Hormonal control - Free Martin Cattle	18Hrs
Unit III	• Sex linked inheritance ◊ Haemophilia and colour blindness in man ◊ Hairy pinna in man • Euploidy and Aneuploidy • Inbreeding and outbreeding • Twins	18Hrs
Unit IV	• Non-disjunction ◊ Anomalies of Autosomes - (Down's) and (Patau's) Syndromes ◊ Anomalies of Allosomes- Klinefelter's syndrome and Turner's syndrome • Pedigree analysis • Inborn Errors of metabolism ◊ Phenylketonuria, Alcaptonuria and Albinism • Eugenics & Euphenics	18Hrs
Unit V	• Nucleic acids as genetic material:	18Hrs

	- DNA as Genetic material ✓ Bacterial transformation ✓ Bacterial conjugation ✓ Transduction - Indirect evidences of DNA as genetic material - RNA as Genetic material (TMV) • Genetic counseling	
Total Contact Hrs		91

➤ *Indices denoted as self study topics*

Power-point Presentations, Seminar, Assignments, Google-classroom

Books for Study:

1. Veer Bala Rastogi (2018) 4th edition, Genetics, Kendraasath, Meerut.
2. Meyyan R. P. (2018) 12th Edition, Genetics – Saras Publications, 114/35 G, A.R.P. Camp Road, Peravallur, Kottar PO, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Miglani G. S. (2002) 1st edition, Advanced Genetics, Narosa Publishing House, New Delhi, 110002
2. Russell, J. (1997) 2nd edition, Essential Genetics, Black well Scientific Publication London
3. Verma and Agarwal (2008) 5th edition, Genetics, S. Chand & Company, Ltd. New Delhi, 110055
4. Gupta, P. K. (2007) 3rd edition, Genetics, Rastogi Publication, Meerut.
5. Kottari, L., *et al.* (2009) 5th edition Essentials of Human Genetics, University Press Private Ltd, Hyderabad, 500029
6. E.D. Garber (1979) Reprint, Uytogenetics—An Introduction TATA McGRAW—Hill Publishing Company Ltd, New Delhi
7. Ajay Paul (2019) —Test book of genetics, Books and allied company, Kolkata
8. P.S. Verma and V.K. Agarwal (2012) Cell Biology, Genetics, Molecular biology, Evolution and Ecology – S.Chand & Company, New Delhi

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	H	H
CO2	H	M	H	M	H
CO3	M	M	M	M	M
CO4	M	H	H	M	H

S-Strong, H-High, M-Medium, L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Sumanth Signature:	Dr. S. Sumanth Signature:	Dr. M. Duranaja Signature:	Dr. R. Muthukumar Signature:
Programme code: B. Sc.		Programme Title : Zoology	
Course Code: ZOATV4N1		Batch : 2023-2025	
		Title Food and Nutrition	
		Semester IV	
Hrs/Week: 1		Non- Major Elective (NME)	
		Credits: 2	

Course Objectives

- To understand the nutritive values of various foods
- To know about the food borne diseases
- To acquire knowledge about food laws

Course Outcomes (CO)

K1	CO1	To recollect the concept of nutritive foods.
K2	CO2	To understand the energy values of various foods
K3	CO3	To apply the importance of food chain.
K4	CO4	To analyze the food deficiency diseases

Unit	Content	Hrs
Unit I	• The scope of food and nutrition • Composition of food (Protein – Carbohydrate – Fat-Vitamins and Minerals) • Function and sources of food	3Hrs
Unit II	• Measurement of energy and energy values of various food • Nutritional requirements – children, adolescence, old age • Balanced diet • <i>Digestion and absorption</i>	5Hrs
Unit III	• Milk – Types – importance in the diet • Eggs – Structures and composition – importance in the diet • Meat – Types – importance in the diet	3Hrs
Unit IV	• Fish – Types – importance in the diet • Vegetables – Types – importance in the diet • Fruits – Types – importance in the diet • Cereals and pulses – Types – importance in the diet	2Hrs
Unit V	• Food spoilage • Food poisoning- food borne diseases • Food adulteration • <i>Hygiene of preparation of potable water</i> • Food laws	2Hrs
Total Contact Hrs		13

➤ *Italics denoted as self study topics*

➤ Assignment Seminar

Books for Study:

1. Anita Tull, (1987) 1st edition. Food and nutrition – Oxford University press, Cambridge
2. Sri Lakshmi, B. (2012) 5th edition. Food Science, New age International Publishers, New Delhi

Books for Reference:

1. Swarnan Puspan Pasricvha, (2000) 1st edition. *Cooking what you eat* – NIN – Hyderabad
2. Tripathy, S. N. (2000) 1st edition. Food Biotechnology. Dominant Publishers and distributors, New Delhi. 110002
3. Sri Lakshmi, B. (2012) 6th edition. Dietetics, New age International Publishers, New Delhi

Mapping

PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO					

CO1	S	H	H	M	S
CO2	S	M	S	M	S
CO3	H	H	H	H	H
CO4	M	S	M	H	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Somasundaram	Dr. S. Somasundaram	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	20UZ4N4	Title	Batch :	2020-2023
		Apiculture (NME)	Semester	IV

Hrs/Week:	1	Credits:	2
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Course Objectives

- To examine the scope of beekeeping in India and other countries
- To identify major bee keeping challenges and opportunities,
- Purchase of honey, wax and byproducts from bee keeping industry

Course Outcomes (CO)

K1	CO1	To remember the steps involved in modern bee keeping techniques and its practical difficulties
K2	CO2	To comprehend methodologies involved in bee keeping
K3	CO3	To apply modern tools in bee keeping and value added product preparation
K4	CO4	To validate different bee keeping techniques and its byproducts

Unit	Content	Hrs
Unit-I	Scope of Apiculture Classification of honey bee Types of honey bee ○ <i>Apis dorsata</i> ○ <i>Apis indica</i> ○ <i>Apis florae</i> Biology of honey bee - External Structure of worker bee Life cycle of honey bee	3Hrs
Unit-II	Social organization of honey bee colony - Queen - Drones and Worker Structure of Beehive Food of Honeybees <i>Relationship between plants and bees- Plant as habitat-systems-pollination</i>	3Hrs
Unit-III	Modern bee hive ○ Langstroth hive ○ Newton's hive Bee keeping equipments Extraction of honey Honey - Properties Chemical composition of Honey <i>Value of honey (Nutritional, Medicinal values)</i>	2Hrs
Unit-IV	Royal jelly - Composition and functions Bee wax - Production Characteristics and uses of bee wax Bee venom - Characteristics and uses	2Hrs
Unit-V	Diseases of honey bee ○ Bacterial disease ○ Viral disease ○ Acarine disease Queen rearing ○ Procedure ○ Hopkins method ○ Miller method and Doolittle method	3Hrs
Total Contact Hrs		13

- *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Discussion

Book for Study:

- Arumugam N. (2017) Applied Zoology, Saras Publication, 114/35 G. A.R.P Camp Road, Peravallai, Kottar PO, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Bhamrah Kavita Juneja H.S. (2001) 2nd edition. An Introduction to Arthropoda-, Anmol Publications Pvt. Ltd., New Delhi.
2. Shukla, Upadhyay (2003). Economic Zoology – Rastogi Publications, Shivaji Road, Meerut-250002, India.
3. Dharm Singh & Sevender Pratap Singh, (2006) edition. A handbook of Bee Keeping –Agrobios (India), Jodhpur.
4. Rajendra Singh & Sachan G.C. (2010) 1st edition Elements of Entomology, . Rastogi Publications, Meerut.
5. Bee keeping basics. MAAREC. Delavane, Maryland, New Jersey, Pennsylvania, West Virginia & the USDA Co-operating PENNSTATE 1855- E-book

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature		Verified by HOD Name and Signature		Checked by CDC	Approved by COE
Dr. S. Christobher		Dr. S. Sumantharam		Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:		Signature:		Signature:	Signature:
Programme code:		Programme Title :		Zoology	
Course Code:		Title		Batch :	
2012ZY 507				2020-2023	

		Core Paper – VII Developmental Biology	Semester	V
Hrs/Week:	5		Credits:	4

Course Objectives

- To understand the basic concepts and definitions of modern developmental biology
- Identify and define the landmark events and advances in developmental biology.
- To know about the applications and recent advances in developmental biology

Course Outcomes (CO)

K1	CO1	To remember the steps and advancements in the developmental biology
K2	CO2	To comprehend embryonic formation and developmental stages with suitable example
K3	CO3	To apply functional knowledge on developmental biology into the frontier sciences
K4	CO4	To sort of embryonic development and its functional applications

Unit	Content	Hrs
Unit -I	• Introduction to Developmental Biology • Programme of Developmental Biology • Theories Pre formation & Spemann's experiments on Organizer • Gametogenesis Spermatogenesis & Oogenesis • Fertilization Mechanism & Significance	13Hrs
Unit -II	• Cleavage in Frog Planes & Patterns of cleavage • Gastrulation in Frog Types of morphogenic movements Exo gastrulation • Fate map • Mechanism of morphogenetic movements	13Hrs
Unit -III	• Organogenesis in Frog -Ectodermal (Brain) -Mesodermal (Heart) -Endodermal (Alimentary canal) • Neoteny Types-factors affecting neoteny- Evolutionary significance • Development of Chick - Development of chick based on hours of incubation • Development and significance of fetal membranes in chick.	13Hrs
Unit- IV	• Placentation in mammals Classification and Functions of placenta • Organizer Structure-properties types and mechanisms induction. • Hormonal control of metamorphosis • Regeneration Types of regeneration Amphibian limb regeneration stimulus and suppression of regeneration.	13Hrs
Unit -V	• Multiple ovulation and embryo transfer technology (MOET) Embryonic sexing, cloning, screening for genetic disorder diagnosis (KSI, GUT etc.) • InVivo Fertilization(IVF)	13Hrs
Total Contact Hrs		65

➤ *Index devoted as self study topic*

Books for Study:

1. Year B&B (2017) Chordate embryology Kedar Nath Munshi (192) B-43 College road, Metara-250001
2. Anniagan, S. (2018) Developmental Zoology: Anur Publications (14050) A.R.P. Camp Road, Perambalur, Kottai Press, Nagercoil - 625002 Tamilnadu, India (2018)

Books for Reference:

1. Bernil, W. J. and Gray M. C. (2010) Developmental biology - Hill Book Co, New York
2. Wesley, (1979) An Outline of animal development - Davenport, Addison - publishers, University of Michigan.
3. Rafinsky, 5th Edition, Embryology - Philadelphia, Saunders College Publishing.
4. Verma P.S & Agarwal V.K (2012) Chordate embryology S Chand & Company Ltd
5. Subramaniam (2002) Developmental Biology, Narosa Publishing House, New Delhi
6. Twyman, R.M. (2001) Developmental Biology, Vista Books Private limited, New Delhi.
7. Chakrapadhyay S. (2010) An Introduction to Developmental Biology, Books and Allied Pvt. Ltd, Kolkata

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Somasundaram Signature:	Dr. S. Somasundaram Signature:	Dr.M.Duramaju Signature:	Dr. R.Muthukumarjan Signature:
Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	2011 AZ 508	Title: Core Paper – VIII Biotechnology	Batch : Semester 2020-2021 V
Hrs/Week:	5		Credits: 4

Course Objectives

- To study the basics and applied aspects of biotechnology
- To understand the different applications of biotechnology
- To acquire the knowledge on bioethics and patenting in biotechnology

Course Outcomes (CO)

K1	CO1	To keep in mind about the basic technologies applied in Biotechnology
K2	CO2	To understand the different blotting techniques, PCR and DNA Fingerprinting
K3	CO3	To apply the cell culture techniques and Patenting- Biotechnology inventions
K4	CO4	To analyze the application of biotechnology and make interest in Bio safety Measure

Unit	Content	Hrs
Unit I	• Scope and importance of Biotechnology • Plasmids pBR 322 • Cosmids • Transposons • Construction of recombinant DNA • Vaccines	13Hrs
Unit II	• Blotting Techniques: ➤ Southern Blotting ➤ Northern Blotting ➤ Western Blotting • Polymerase Chain Reaction (PCR) & its applications, RFLP • DNA Finger printing • <i>Genomic library</i>	13Hrs
Unit III	• Establish cell lines- Primary and secondary • <i>Biotrans (Self Study)</i> • Monoclonal antibodies • Transgenic animals - Microinjection method - Applications of transgenic animals example: Mice	13Hrs
Unit IV	• Animal tissue culture □ Explants □ Culture media □ Culture of animal tissues • Animal bioreactors: three bioreactors & its application □ Nano- biotechnology- scope and applications	13Hrs
Unit V	• <i>Bacillus thuringensis</i> as a pesticide • Biofertilizer • Biosensors • Biosafety • Bioethics □ Monitoring the welfare of transgenic animals □ Keeping of transgenic animals • Patenting ▪ IPR ▪ TRIPS	13Hrs
Total Contact Hrs		65

➤ *Italic denoted as self study topics*

Power point Presentations, Seminar, Assignment, Google class room

Books for Study:

1. Sathyanarayana U. (2017) Biotechnology, 12th Printing Arunabha sen Books and Allied (P)Ltd
8/1 chintamani Das lane, KolKata 70009 (India)
- 2 Gupta P K. (2004) Elements of biotechnology – Rastogi publications, Meerut

Books for References:

1. Ignacimuthu. S. (1995). Basic Biotechnology, Tata McGraw Hill Publishing Company Ltd, New Delhi.
2. Dubey, R. C. (1996) A text book of Biotechnology, Cambridge University Press
3. Molecular Biology and Biotechnology (1993) S Chand & Company Ltd, New Delhi
4. John E. Smith. (1993) Biotechnology, Vikas Publishing House Pvt. Ltd, New Delhi
5. Balasubramanian. D. C.F. A. Bryce, Dharmalingam. K. J. Green, Kunthala Jayaraman (2005) Concepts in Biotechnology, University Press (India) Pvt. Ltd, Hyderabad
6. Jayanto Aebreakar (2007) Fermentation biotechnology, Dominant Publishers, New Delhi
7. Sayyed and Patil (2009) Biotechnology – emerging trends Scientific publishers India
8. Kumaresan V. (2014) Biotechnology –Saras publications, 114/35G, A.R.P Camp Road, Peraiyilai Kottar Post, Nagercoil - 629002, Tamilnadu, India
9. Kumaresan V. and Arumugam N. (2017) Animal Biotechnology –Saras publications, 114/35G, A.R.P Camp Road, Peraiyilai, Kottar Post, Nagercoil - 629002, Tamilnadu, India

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	H	H

S-Strong, H-High, M-Medium, L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Christobher	Dr. S. Sornakumaran	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B Sc	Programme Title :	Zoology
Course Code:	20KZY509	Title	Batch : 2020-2023
		Core Paper –IX	Semester V
		Biostatistics and Biophysics	
Hrs/Week:	5		Credits: 4

Course Objectives

- The basic knowledge about Biostatistics and Biophysics
- To understand the basic principles of instruments
- To acquire knowledge about the basic formula used in biology

Course Outcomes (CO)

K1	CO1	To recollect the concepts of biostatistics and biophysics
K2	CO2	To understand the formula and principles used in biology
K3	CO3	To apply different data used in biological samples.
K4	CO4	To analyze the importance about instruments in biological laboratory.

Unit	Content	Hrs
Unit I	• Collection of data ◦ Methods of collection – Random and Non-random sampling ◦ Primary and Secondary data • Tabulation & Types ◦ Parts of table • Diagrammatic presentation ◦ Line diagram, Bar diagram & Pie diagram • Measures of central tendency ◦ Mean, Mode and Median	13Hrs
Unit II	• Standard deviation • Mean deviation ◦ Individual - Discrete and Continuous series ◦ Measures of dispersion • Correlation ◦ Karl Pearson's coefficient of correlation ◦ Types of correlation • Regression analysis ◦ Types and methods	13Hrs
Unit III	• Chi-square Test ◦ Degrees of freedom ◦ Student t-test • Analysis of Variance (ANOVA) - One-way analysis	13Hrs
Unit IV	• Scope of Biophysics • Thermodynamics principles ◦ First and second law • Bioluminescence ◦ Types & Significance	13Hrs
Unit V	• Instrumentation ◦ Compound microscope ◦ Electron microscope - Transmission Electron Microscope (TEM) and Scanning Electron Microscope (SEM) ◦ Chromatography - Thin layer chromatography (TLC) ◦ Agarose & Electrophoresis - Polyacrylamide Gel	13Hrs

Electrophoresis (PAGE)	
Total Contact Hrs	65

➤ *Italicized denoted as self study topic*

Assignment, PPT, Seminar, group discussions

Books for Study:

1. Arumugam N. (2019), Basic concepts of Biostatistics - Saras-publication 114/35 G, A.R.P Camp Road, Periyavilai, Kottar PO, Nagercoil -629 002, Kanyakumari
2. Arumugam N. and Kumarasan V. (2016) Biophysics and Bioinstrumentation -, Saras publication, 114/35 G, A.R.P Camp Road, Periyavilai, Kottar PO, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Veer Balu Rastogi (2009) 2nd edition Fundamentals of biostatistics, Ane Books, Pvt. Ltd. New Delhi
2. Rana, S. V. S. (2009) 2nd edition, Biotechniques – Theory and Practice, Rastogi Publication, Meerut
3. P. K. Srivastava, (2005) 1st edition, Elementary Biophysics – Narosa Publishing House, New Delhi, 110 002
4. Subramanian, M. A. (2005) 1st edition, Biophysics – Principles and Techniques- MDP Publishers, Chennai, 600 005
5. Sengupta Prasad (3rd Rev. Ed. 2012) – Biostatistics - Rastogi Publication, Meerut

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	S	H	S	
CO2	H	M	H	H	M	
CO3	M	S	M	M	M	
CO4	M	H	M	M	M	

S-Strong, H-High, M-Medium, L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. M. Durairaja	Dr. S. Sureshbabu	Dr. M. Durairaja	Dr. R. Muthukumarar
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	ZBLZY614	Title	Batch : 2020-2023
		MAJOR PRACTICAL-III (Developmental biology, Biostatistics& Biophysics; Animal Physiology and Endocrinology, Bioinformatics and Biochemistry and Medical Laboratory Techniqte)	Semester V & VI
Hrs/Week:	2		Credits: 4

Course Objectives

- To gain the practical knowledge on Zoology
- To know about the structure and functions of various biomolecules
- To attain knowledge on blood cell count and its importance

Course Outcomes (CO)(for Practicals Only)

K3	CO1	To recollect the importance of laboratory test
K4	CO2	To understand the normal level of human samples
K5	CO3	To apply the instruments used in biological experiment.

Content
EXPERIMENTS • Analysis of Excretory products • Total count of RBC • Total count of WBC • Estimation of haemoglobin by using haemoglobinometer • Preparation of Blood smear • Bleeding and clotting time • Estimation of Erythrocyte Sedimentation (ESR) in human • Find the mean and Standard deviation of the given samples • Estimation of glucose by using digital method • Multiple bar diagram • Pie diagram • Frequency polygon SPOTTERS Developmental Biology (structure/developments) • Egg of Frog • Cleavage of Frog • Blastula of Frog • Chick embryo - 24 hours • Chick embryo - 72 hours • Chick embryo - 96 hours • Placenta of sheep • Human foetus Biostatistics and Biophysics (statistical importance) • Compound microscope • Electron microscope (TEM) • Thin Layer Chromatography (TLC) • Electrophoresis - PAGE Animal physiology & Endocrinology (structure and function) • T. S. of thyroid gland • T. S. of ovary • T. S. of testis • Mammalian eye • Mammalian ear Medical Laboratory Technique (MLT) - (structure, principle and uses) • Haemocytometer • Albuminometer • Automatic blood pressure monitor • Urinometer Bioinformatics and Biochemistry (Structure and uses) • Phylogenetic tree (Rooted tree) • RasMol (Visualization tool) • BLAST • Structure of pentose

• Structure of cholesterol
Content
Total Contact Hrs 52

Mark Distribution:

Total Marks	Internal(CIA)	Marks	End of semester Practical Examination (ESE)	Marks
100	Practical Skill/observation	10	Experiments Major Practical	20
			Minor Practical	10
	Model Practical Examination	20	Spotters	20
	Record work	10	Record	10
	Total Marks	40	Total Marks	60

Hands on experience in practicals, Activity;

Books for Reference:

1. Arumugam .N. (2017) Developmental Zoology - Saras Publication, 114/35G, A.R.P Camp Road, Periyavilai, Kottar Post, Nagercoil - 629002 , Tamilnadu, India.
2. H. R. Singh and Neerajkumar, (2014). Animal Physiology and biochemistry, Vishal Publishing Co. Islandhar, Delhi
3. Ramnik Sood, Medical Laboratory Techniques (MLT). (1999) 5th edn. Jaypee Brothers Medical publishers (P) Ltd. Delhi
4. Mariakuttrikan . A. and Arumugam, N. (2014). Animal Physiology . Saras publication. Nagercoil, Kanyakumari Dist. Tamil Nadu

Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	H	S	H
CO2	M	H	M	H	M
CO3	S	H	H	M	M

S-Strong, H-High, M-Medium, L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. M. Durairaju Signature:	Dr. S. Somasundaram Signature:	Dr. M. Durairaju Signature:	Dr. R. Muthukumaran Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	20UZY615	Title	Batch :	2020-2021
		MAJOR ZOOLOGY PRACTICAL -IV (Ecology, Evolution, Biotechnology, Microbiology, Sericulture and Aquaculture)	Semester:	V & VI
Hrs/Week:	2		Credits:	4

Course Objectives

- To obtain practical knowledge in ~~ecology~~, ~~evolution~~, ~~biotechnology~~, ~~microbiology~~, ~~sericulture and aquaculture~~
- To study the physico-chemical nature of environment.
- To understand the different water quality analysis

Course Outcomes (CO)

K3	CO1	To recollect the knowledge on Ecology, Evolution, Biotechnology, Microbiology, Sericulture and Aquaculture
K4	CO2	To understand the estimation of different water quality parameters, microbial culture and morphometric measurement of fish.
K5	CO3	To access the micro environment and report preparation.

Content

EXPERIMENTS

- Estimation of dissolved oxygen in water samples.
- Estimation of carbon dioxide
- Estimation of salinity in water samples.
- Determination of pH in water samples
- Culture medium preparation (Demonstration only)
- Milk Methylene Blue Test
- Meristic measurements of fish by using model.
- Water quality analyzer (Demonstration only)

SPOTTERS

Ecology and Evolution

- Alburna
- Hippa
- Anguilla
- ~~Fossil~~
- Vermiform appendix
- Giraffe
- Lung fish

Biotechnology/ Microbiology

- E-Coli
- Plasmids
- Biodiesel Plant - Jatropha
- PCR
- Micropipette
- Magnetic stirrer
- Laminar Air Flow
- Gel Electrophoresis

Sericulture

- Silk worm
- Silk gland
- Cocoon
- Mulberry shoot
- Netrika/elsandrika
- Leaf Mosaic disease

- Pebrine
- Aquaculture**
 - Common Carp
 - Snucker fish
 - Live feed - *Daphnia*
 - Gill net
 - Fish parasite - *Argulus*
 - Chinese dip net
 - Edible Oyster
 - Pearl oyster – *Pinctada vulgaris*
 - Termasias

Total Contact Hrs

52

Mark Distribution:

Total Marks	Internal(CIA)	Marks	End of semester Practical Examination (ESE)	Marks
100	Practical	10	Experiments	20
	Skill/observation		Spotters	20
	Model Practical Examination	20	Field visit /Micro-environmental study/ report preparation	10
	Record work	10	Record	10
	Total Marks	40	Total Marks	60

Hands on experience in practicals, Activity,

Books for Reference:

1. Ganga, G and Sulochana chetty (1999). An introduction to sericulture. Oxford and IBH Publishing company Pvt. Ltd. New Delhi
2. Jayasturya. (2016). Economic Zoology. Saras publication. Nagarcoil, Kanyakumari Dist. Tamil Nadu
3. Kumaresan, V (2016) Biotechnology. Saras publication. Nagarcoil, Kanyakumari Dist. Tamil Nadu
4. Odum, E. P (1971) Fundamentals of ecology W.B. Sanders Company, London
5. Arumugam, N. (2016) Aquaculture SARAS Publications, Nagarcoil, Tamilnada.
6. ICAR Publication (2006) 1st edition. Hand book of fisheries and aquaculture, Directorate of information and publications of agriculture. Indian Council of Agricultural Research, New Delhi
7. Sinha J. Chatterjee A.K. and Chattopadhyay. P. (2011). Advanced practical Zoology, Books and Allias (pvt. Limited), Kolkata

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	M	H	H	H
CO3	M	S	H	M	M

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Somasundaram Signature:	Dr. S. Somasundaram Signature:	Dr.M.Durairaju Signature:	Dr.R.Muthukumaran Signature:

Programme code:	B Sc	Programme Title :	Zoology	
Course Code:	20 UZV510	Title	Batch :	2020-2023
		Core Paper - X Biochemistry and Bioinformatics	Semester	V
Hrs/Week:	5		Credits:	5

Course Objectives

- To know the chemical structure of macromolecules and their metabolic activity.
- To acquire the knowledge on biological databases.
- To study the basic bioinformatics tools and its uses

Course Outcomes (CO)

K1	CO1	To keep in mind the basic bioinformatic tools and its uses.
K2	CO2	To comprehend the genomic study, phylogenetic analysis and sequence analysis
K3	CO3	To apply the basic and applied knowledge of Biochemistry
K4	CO4	To sort the core principles of biochemistry

Unit	Content	Hrs
Unit I	Biochemistry • Classification of Carbohydrates: ○ Monosaccharides - Pentoses- Hexoses ○ Disaccharides ○ Polysaccharides - Homopolysaccharide & Heteropolysaccharide • Classification of Lipids: ○ Simple Lipids - Fats ○ Compound lipids - Phospholipids ○ Derived lipids - Glycerol • Classification of Proteins: ○ structure : Simple – Conjugated and Derived proteins ○ solubility: Globular and Fibrous proteins	13Hrs
Unit II	• Amino acids – Structure and types ○ Essential ○ Non-essential • Nucleic acids ○ Nucleosides ○ Nucleotides ○ Polynucleotide • Enzymes ○ Classification and Properties of enzymes • Vitamins ○ Properties of vitamins ○ Classification of vitamins	13Hrs

Unit III	• Scope of Bioinformatics • Databases ◦ Biological database (Properties and classification) ◦ Specialized database • Protein sequence database - SWISS-PROT • Data mining • Virtual Library	13Hrs
Unit IV	• Genomics - Classification and applications • Proteomics - Classification and applications • Drug designing • Human genome project ◦ Goals and techniques ◦ Potential benefits • <i>Bioinformatics tools and its uses</i>	13Hrs
Unit V	• Similarity tool - BLAST • Visualizing tool - RasMol • Miscellaneous tool - Webcutter • Phylogenetic analysis - Definition and applications • Construction of phylogenetic tree • Structure of rooted tree	13Hrs
Total Contact Hrs		65

➤ *Topics denoted as self study topics*

Power point Presentations, Seminar, Assignment, group discussions, Google class room, Case study

Text Book:

1. Sunkaralingam R & Kumaresan V. (2015) Bioinformatics, Sarax Publication, 114/35G, A.R.P Camp road, Peravallai, Kovar P.O. Nagercoil, Kanyakumari.
2. Thulsi Easara, (2016) Biochemistry - Sarax Publication, 114/35G, A.R.P Camp Road, Peravallai, Kovar Post, Nagercoil - 629002, Tamil nadu, India
3. Sathyanarayana U. & Chakrapani, U. (2009) 2nd Edition, Essential of Biochemistry - Books & Allied publishers 55/1, Beliaghata main road, Kolkata 700010, India

Reference Book:

1. Srinandes, Kama Thakral, (2007) Bioinformatics-Orpita Bosa, Oxford University Press, New Delhi 110001
2. Atwood, T.K. and Parry-Smith D.J. (1999) Introduction to Bioinformatics - Addison Wesley Longman, Harlow
3. Faelker, M.H. (2009) Bioinformatics - Applications in Life and Environmental Sciences Capital Publishing Company, New Delhi
4. Ignacimuthu, S. (2005) Basic Bioinformatics - Narosa Publishing House, New Delhi
5. Shartun, Munjal & Shankar (2008) A text book of Bioinformatics - Rastogi Publications, Meerut, India.
6. Jin Xiang, (2006) Essential Bioinformatics Cambridge University Press
7. Subramanian C. (2010) Genomic Bioinformatics- Dominant Publisher, New Delhi
8. Rastogi, S. C. (1995) Biochemistry - Tata McGraw-Hill Education.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	H
CO2	H	M	H	H	H
CO3	M	H	H	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Mariselvi	Dr. S. Somasundaram	Dr.M.Durairaju	Dr.R.Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code: B. Sc.	Programme Title : Zoology
Course Code: ZBLJZY5E3	Title Batch : 2020-2021
	Core Elective Paper – I Semester V
Hrs/Week: 4	Credits: 5

Course Objectives

- To understand the basic principles and applications of M.L.T
- To know the knowledge about sexual diseases
- To acquire the knowledge about instruments usage

Course Outcomes (CO)

K1	CO1	To remember the structure and function of medical laboratory instruments
K2	CO2	To understand the methods used in medical laboratory
K3	CO3	To apply knowledge about laboratory diagnosis
K4	CO4	To analyze and estimation of blood, urine, faeces, sputum and semen

Unit	Content	Hrs
Unit I	• Introduction ◊ Code of conduct for laboratory personnel ◊ Structure of a laboratory • Laboratory instruments ◊ Centrifuge ◊ Autoclave ◊ ECG ◊ B. P. apparatus and sphygmoscope ◊ Urinometer ◊ <i>Albuminuria</i> ◊ General procedure – cleaning +Sterilization and disposal of infected materials ◊ <i>Safety measures and first aid</i>	11Hrs
Unit II	• Haematology ◊ Blood collection ◊ Anticoagulant – Ammonium & Potassium oxalate mixture ◊ Bleeding time and clotting time ◊ Staining of blood films ◊ Estimation of haemoglobin ◊ Blood cell total count – RBC and WBC ◊ Erythrocyte Sedimentation Rate (ESR) ◊ Glucose Tolerance Test (GTT) ◊ Blood glucose ◊ <i>Anaemia- Iron deficiency anaemia</i>	10Hrs
Unit III	• Urine Analysis ◊ Collection & preservation of urine ◊ Physical examination ◊ Chemical examination ◊ Microscopic analysis • Stool Analysis ◊ Collection & preservation ◊ Physical examination ◊ Microscopic examination	11Hrs

Unit IV	• Sputum Analysis ◦ Collection & preservation ◦ Naked eye inspection ◦ Microscopic examination ◦ Chemical examination • Semen Analysis ◦ Collection of semen ◦ Physical examination ◦ Microscopic analysis ◦ Preparation of smear and staining	10Hrs
Unit V	• Pregnancy test ◦ Immunological methods ◦ Pregnancy card • Sexual Diseases ◦ Syphilis ◦ <i>Gonorrhoea Disease</i> • Clonal Bank ◦ Ova Bank ◦ Semen Bank ◦ Gene Bank	10Hrs
Total Contact Hrs		52

➤ *Italics denoted as self study topics*

➤ Assignment , Seminar , Power point presentation, Google class room

Books for Study:

1. Dutta, A. (2009) Experimental Biology A laboratory manual. Narosa Publishing House . New Delhi
2. Ramnik Sood. M.T. (1999) 5th edition. Jaypee Brothers Medical publishers (P) Ltd. Delhi

Books for Reference:

1. Sachdev, K. N. (1991) Clinical pathology and bacteriology. Jaypee brothers- medical publishers, New Delhi
2. John Macleod and John Munro. (1988) Clinical Examination. ELBS publishers
3. Samuel, K. M. (1982) Notes on Clinical Lab Techniques. K. Gopalan publishers, Madras

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	H	H	S
CO2	H	H	S	S	H
CO3	H	S	S	H	H
CO4	S	H	H	H	S

S-Strong; H-High, M-Medium, L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. S. Somanmudhan	Dr. M. Durairaj	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B Sc	Programme Title :	Zoology	
Course Code:	ZOOZY3P2	Title	Batch :	2020-2023
		Core Elective paper II Poultry Science And Management Technology	Semester	V
Hrs/Week:	5		Credits:	5

Course Objective

- To know the basic concept of poultry science
- To understand the construction of poultry farm
- To get the knowledge about different breeders

Course Outcomes (CO)

K1	CO1	To keep in mind the role of poultry science.
K2	CO2	To get the idea on poultry house and management.
K3	CO3	To execute feed formulation for broiler, layer and breeders.
K4	CO4	To evaluate the nutritive value of poultry meat and egg. To analyze the transport and marketing.

Unit	Content	Hrs
Unit I	• Importance and role of the poultry in rural development and employment potential. • Anatomy and physiology of poultry birds (hen) with reference to digestive and reproductive systems.	11Hrs
Unit II	• Poultry house and equipment. • Space requirements • Types of houses • <i>Summer management- Winter management</i> • Sterilization of rooms	10Hrs
Unit III	• Classification of feed stuffs • Availability of raw materials and their cost • <i>Feed formulation and Feeding programme</i> • Equipment for feeding and drinking	11Hrs
Unit IV	• Management of Broilers • Management of layers • Management of Breeders • Common diseases - Bird flu disease • Antibiotics - Vaccination and deworming • Insecticide treatment and Bio-remedies	10Hrs
Unit V	• <i>Nutritive value of poultry meat and egg</i> • Grading and Preservation of eggs • Packing and Transport and Marketing • Different uses of eggs • Poultry manure.	10Hrs
Total Contact Hrs		52

* *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Case study.

Book for study

1. Anandam, N. (2018) Applied Zoology, Saras Publication, #14/35 G ARP Camp Road, Periyavilai, Nagarcot, Kanyakumari - 629 002.

Books for Reference:

1. Rice . E.J and Botosford . H. E. Practical poultry management . John Wiley, Hansen Inc. N.Y.
2. Gnanmani. J . Profitable poultry product ; Pyton publ. Co. Madurai, Tamilnadu
3. Siddiqui. H.M Manual of poultry production Practicals : College of Veterinary Science, Andrapradesh.
4. Shukla. Upadhyay (2003). Economic Zoology –Rastogi Publications, Shivaji Road, Meerut- India

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	M	H	H	H
CO3	M	S	S	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. S. Somasundaram	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	20B-ZV551	Title	Batch :	2020-2021
		Network and Information Security (SBE- Online)	Semester	V
Hrs/Week:	1		Credits:	2

Course Objective

- To impart knowledge of Network security, Wi-Fi security, hackers, secure networking and password managers.

Course Outcomes (CO)

K1	CO1	To remember the basic concepts of network.
K2	CO2	To understand the network hacking techniques.
K3	CO3	To deploy information and network security.
K4	CO4	To interpret the common threats today in computer network.

Unit	Content	Hrs
Unit I	Basics of Network – Network Media – Various Operating Systems – Basics of Firewalls on all Platforms including Windows, MacOS and Linux.	3Hrs
Unit II	Security Vulnerabilities across an entire network – Network Hacking techniques and Vulnerability scanning.	3Hrs
Unit III	Configure and architect a small network for physical and wireless security – Firewalls configuration on Windows platform and Linux platform – Network privacy issues.	2Hrs
Unit IV	Network monitoring to discover and identify potential hackers and malware using tools like WIFSHARK and SYSLOG – Online tracking by hackers.	2Hrs
Unit V	Best methods of authentication including passwords, multifactor authentication including soft tokens and hard tokens – Best password managers to use – how passwords are cracked – how to mitigate the password attacks.	3Hrs
Total Contact Hrs		13

Google classroom

Reference:

Course Materials will be made online through NGM Open source learning platforms.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	H	H
CO3	M	H	H	M	M
CO4	M	H	H	H	H

S-Strong, H-High, M-Medium, L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. M. Durairaj	Dr. S. Somanathan	Dr. M. Durairaj	Dr. R. Muthukumar
Signature	Signature	Signature	Signature

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	90CZ3352	Title	Batch :	2020-2023
		Cyber security – Ethical Hacking (SDE – Online)	Semester:	V
Hrs/Week:	1		Credits:	2

Course Objective

- To understand the basics of cyber security and how ethical hacking is done on Cyber-space and how to secure and protect them like security experts.

Course Outcomes (CO)

K1	CO1	To remember the basic concepts of cyber security
K2	CO2	To understand the knowledge about ethical hacking
K3	CO3	To deploy the use of hacking tools
K4	CO4	To analyze the details about internet connection

Unit	Content	Hrs
Unit I	To Understand how websites work, how to discover and exploit web application vulnerabilities and to gain full control over websites. Secure systems from all the known attacks. Secret tracking and hacking infrastructure	3Hrs
Unit II	Ethical hacking in Cyber space - its fields and the different types of hackers. Hack & secure both Wi-Fi & wired networks	3Hrs
Unit III	Discover vulnerabilities & exploitation of hacking in cyber network servers. How secure systems are hacked using client-side and social engineering attacks. Use of hacking tools such as Metasploit, Aircrack-ng, SQLmap, etc.	2Hrs
Unit IV	Network basics & how devices interact inside a network – Network Penetration. Control connections of clients in network by password cracking, Fake Wi-Fi network creation with internet connection and spy on clients. To Gather detailed information about clients and networks like their OS, opened ports etc.	2Hrs
Unit V	Explore the threat landscape - Darknets, dark markets, zero day vulnerabilities, exploit kits, malware, phishing and much more. Master defenses against phishing, SMSing, vishing, identity theft, scam, con and other social engineering threats.	3Hrs
Total Contact Hrs		13

Google class room

Reference:

Course Materials will be made online through NQM Open source learning platforms

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	M	H	S
CO2	H	M	H	M	H
CO3	M	H	M	M	M
CO4	M	M	H	H	H

S-Strong, H-High, M-Medium, L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. M. Durairajulu	Dr. S. Sureshkumar	Dr. M. Durairajulu	Dr. R. Mathiakumaran
Signature	Signature	Signature	Signature

Programme code:	B.Sc	Programme Title :	Zoology	
Course Code:	2012/V/111	Title	Batch :	2019-2021
		Core Paper – XI Animal Physiology and Endocrinology	Semester	VI
Hrs/Week:	5		Credits:	5

Course Objectives

- The understanding the chemical process/associated with living cell
- To study the basis for various organ systems in the animal kingdom
- To understand the mechanism of hormonal actions

Course Outcomes (CO)

K1	CO1	To remember the bio chemical and physiological structure and activity of individual cell level
K2	CO2	To comprehend physiological activity of organ system and bio chemical activity of cells
K3	CO3	To apply functional knowledge on various organs, endocrine glands and its status
K4	CO4	To sort of animal is physiology and endocrinology

Unit	Content	Hrs
Unit- I	• Digestion & Digestive glands ◊ Digestion and absorption ◊ Metabolism of Carbohydrates, Glycolysis, Glyoxysmalic-Krebs cycle & Citric acid cycle ◊ Metabolism of lipids-phospholipids of fatty acids ◊ Metabolism of proteins- Transamination and Deamination ◊ Neuroendocrine regulation of gastro – intestinal movements and secretions. • Respiration: ◊ Aerobic & Anaerobic respiration ◊ Respiratory pigments in animals ◊ Transport of gases – O₂ and CO₂	13Hrs
Unit- II	• Circulation: ◊ Myogenic & Neurogenic heart ◊ Pacemaker and electrical activity of heart in man ◊ Composition and functions of blood & lymph • Water Balance: ◊ Osmotic and ionic regulations in aquatic animal (Fish) • Receptors: ◊ Chemoreceptors ◊ Gustatoreceptors ◊ Olfactoreceptors ◊ Photoreceptor ◊ Phonoreceptor	13Hrs
Unit -III	• Effectors: ◊ Types of muscles : Striped- unstriped and cardiac muscles ◊ Structure and properties of striped muscle • Mechanism of muscular contraction- sliding filament theory • Nervous system: ◊ Structure & neuron ◊ Conduction of nerve impulse ◊ Neuromuscular junction ◊ Reflex action and reflex arc • Excretion ◊ <i>Structure of mammalian kidney</i>	13Hrs

	▫ Structure of Nephron ▫ Synthesis of ammonia - urea and uric acid ▫ Formation of urine • Reproductive system: ▫ Structure of Male and female reproductive system	
Unit- IV	• Scope of Endocrinology • Endocrine glands (Structure & Functions): ▫ Pituitary ▫ Thyroid ▫ Parathyroid ▫ Pancreas ▫ Testes & ovary • Hormonal interactions- Feedback control mechanisms.	13Hrs
Unit- V	• Mechanism of hormone action: peptide, steroid & thyroid • Hormonal disorders: ▫ Pancreas (Diabetes mellitus) ▫ Thyroid (Goiter) ▫ Pituitary (Gigantism - Dwarfism) ▫ Sex hormones (Infertility)	13Hrs
Total Contact Hrs		65

➤ *Units divided as self study topics*

Power point Presentations, Seminar, Assignment, Discussion, Activity, Case study, Google classroom

Books for Study:

1. Ramo S.T. (2006) *Essentials of Animal Physiology* 4th Edition. New and international publications.
2. Arunagiri N. (2018) *Animal physiology* – Sarva Publications. 111, 356, A.R.P Linap Road, Periyar Junction, Kottar Peta, Nagercoil – 629002, Tamilnadu, India

Books for Reference:

1. Parameswaran, Ananthakrishnan & Ananthasubramanian, (1991) *Outline of animal physiology* – S. Viswanathan printers & Publishers Pvt. Ltd.
2. Verma, P. S., Tyagi and Agarwal. (1997) *Animal physiology* – Chand & company Ltd.
3. S. Sree Kumar, (2010) *Basic Physiology* – PHI Learning Pvt. Ltd, New Delhi, 110001, Edition.
4. Berry, A.K. *A text book of Animal Physiology* – EMKAY Publication, New Delhi-110051
5. Sree Kumar S. (2010) *Tollison, Basic Physiology* –, PHI Learning Pvt. Ltd, New Delhi.
6. Susey, K.V. (2009-2010) *Endocrinology & Reproductive Biology* – Rastogi Publications, Shivaji road, Meerut-250002, India
7. Prakash S. Lohar. (2005) *Endocrinology* – MJP Publishers, Chennai
8. Surish R. (2012) *Essentials of Human Physiology* – Books and Allied Pvt. Limited, Kothamangalam
9. Arora M.P. (2015) *Animal Physiology*, Himalaya Publishing house, Mumbai

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong, H-High, M-Medium, L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Sornasundaram Signature:	Dr. S. Sornasundaram Signature:	Dr. M. Durairaju Signature:	Dr. R. Muthukumar Signature:

Programme code:	B.Sc.	Programme Title:	Zoology
Course Code:	ZOL 6553	Title:	Batch: 2020-2021
		Core Paper – XII	Semester: VI
		Ecology and Evolution	
Hrs/Week:	5	Credits:	4

Course Objective

- To know the concepts of Ecology
- To acquire knowledge about the origin of life
- To understand the animal relationships.

Course Outcomes (CO)

K1	CO1	To recollect the importance of abiotic factors and origin of life
K2	CO2	To understand the basic concepts of animal relationship and fossils
K3	CO3	To apply knowledge about animal ethics and evidences of evolution
K4	CO4	To analyze the animal population and organic evolution of man
Unit	Content	Hrs
Unit I	• Scope of Ecology • Abiotic factors ◊ Soil: Pedogenesis - Soil texture- Soil profile - Soil fauna, types of soil erosion ◊ Water: Properties of water ◊ Temperature: Range of temperature- Thermal stratification- biological effects of temperature ◊ Light: light on water - biological effects of light	13Hrs
Unit II	• Biogeochemical cycle ◊ Gaseous cycle - Carbon cycle- Nitrogen cycle ◊ Sedimentary cycle: Sulphur cycle- Phosphorus cycle • Animal relationship ◊ Commensalism ◊ Mutualism ◊ Parasitism • Animal population ◊ Characteristics of population - Natalty- mortality-growth-density • Human Ecology ◊ Population growth (Explosion), Population control • Space Ecology ◊ Physiological changes during space travel	13Hrs
Unit III	• Theories of Evolution • Biochemical origin of life • Orey and Miller's experiment • Geological time scale • Fossils Types and Dating of fossils	13Hrs
Unit IV	• Evidences of evolution ◊ Morphological: Homologous structures - vestigial organs - connecting links ◊ Embryological: Recapitulation theory ◊ Palaeontological: Missing links	13Hrs
Unit V	• Lamarckism Principle of Lamarckism • Darwinism: Over production - variation - survival of the fittest - struggle for existence - origin of species • Neo darwinism(Modern Synthetic theory) • Organic evolution of man	13Hrs
Total Contact Hrs		65

Assignment, Seminar, PPT, discussions, Case study

Books for Study:

1. Arumugam N. (2019) Concepts of ecology. Saras publication 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PO, Nagercoil -629 002, Kanyakumari
2. Arumugam N. (2015) Organic Evolution— Saras publication 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Odum F. P. (1971) 1st edition. Fundamentals of ecology. W. B. Saunders Company, London.
2. Verma and Agarwal, (2003) 5th edition. Principles of Ecology. S. Chand & Company, Ltd. New Delhi, 110055
3. Tomar and Singh, (2010) 8th edition. Evolutionary Biology - Rastogi Publication, Meerut. 250 002
4. Saha, T. K. (2002) 1st edition. Life: Origin, evolution and adaptation. Books and allied (P) Ltd. Kolkata – 700 010
5. N.Arumugam(2015) – Ecology, Toxicology and Evolution, Saras Publications, Kanyakumari

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	M	M	S
CO2	H	S	H	M	H
CO3	H	M	M	H	M
CO4	M	M	H	M	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature Dr. M. Durairaju	Verified by HOD Name and Signature <i>Dr. S. Somasundaram</i>	Checked by CDC Dr. M. Durairaju	Approved by COE Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc	Programme Title :	Zoology
Course Code:	2012ZY113	Title	Batch : 2024-2027
		Core Paper – XIII	Semester VI
		Microbiology and Immunology	
Hrs/Week:	5	Credits:	4

Course Objectives

- To acquire a basic knowledge of microbiology and immunology
- To know the working mechanism of immunity
- To study the basic methods in microbiology

Course Outcomes (CO)

K1	CO1	To keep in mind the scope of microbiology and immunology
K2	CO2	To understand the classification of microorganisms and immunity
K3	CO3	To apply the knowledge about food microbiology, Agricultural microbiology, Medical microbiology
K4	CO4	To analyse the disease producing microorganism

Unit	Content	Hrs
Unit I	• Introduction and scope of microbiology • Classification of microorganisms • Basic methods in Microbiology ◊ Pure culture- Isolation and purification techniques ◊ Types of culture media ◊ Preparation of Culture media ◊ Culture techniques of microorganisms • Staining procedure and types of staining ◊ Simple staining ◊ Negative staining ◊ Gram staining ◊ Acid-fast staining	13Hrs
Unit II	• Bacteria ◊ Major features and structure of bacteria ◊ Economic importance of bacteria ◊ Bacterial growth and Growth curve ◊ Bacterial culture - Culture of <i>E. Coli</i> • Viruses ◊ Characteristic and structure of viruses ◊ Classification of Virus ◊ Structure of Bacteriophage	14Hrs
Unit III	• Applied microbiology ◊ Agricultural microbiology:- • Role of microorganism in soil fertility • Biofertilizers • Harmful role of microorganism ◊ Food microbiology:- • Microorganisms of food • Factors influence microbial growth • Biochemical changes of Food spoilage • Food preservation ◊ Medical microbiology • Normal microflora of human body • Bacterial Diseases - Botulism, Cholera • Viral Diseases - Measles, Viral hepatitis	13Hrs

Unit IV	Immunology - Introduction and scope of immunology Classification of Immunity – (Innate and Acquired Immunity) Immune Response - Mechanism of Humoral immune response - Mechanism of Cell mediated immune response Lymphoid Organs - Primary lymphoid organs - Secondary lymphoid organs Cells of the immune system - Lymphoid lineage - Myeloid lineage	13Hrs
Unit V	Immunoglobulins - Structure of immunoglobulin - Classes and properties of immunoglobulin Classification of Major-Histocompatibility Complex- (MHC) Tumor immunology - Types of tumor - Properties of tumor cells - Cause of tumor - Factors involved in tumor immunity - Immune diagnosis and immunotherapy of tumor	13Hrs
Total contact Hrs		65

➤ *Italics denoted as self study topics*

Assignment, Seminar, Power point

Books for Study:

1. Mam, A., Selvaraj, A.M., Narayanan, L. M. and Arimugam, N. (2007) Microbiology Saras publications, 114/35 G, A.R.P -Camp Road, Peravillai, Kottar PQ, Nagercoil -629 002, Kanyakumari
2. Dubey Farima and N. Arimugam. Immunology (2013) Saras Publications, 114/35 G, A.R.P Camp Road, Peravillai, Kottar PQ, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Dubey R. C. and Maheswari, D.K. (2013) A Text book of Microbiology, Cambridge University Press
2. Ignacimuthu, S. (1995) Basic Biotechnology – Tata McGraw Hill Publishing Company Ltd. New Delhi
3. Dubey, R. C. (1996) A text book of Biotechnology – Cambridge University Press
4. John E.Smith. (1993) Biotechnology – Vikas Publishing House Pvt. Ltd. New Delhi
5. Gupta P. K. (2004) Elements of biotechnology – Rastogi Publications, Meerut
6. Shyamalree ghosh. (2017) Immunology and Immunotechnology – Books and allied (P) Ltd.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	H	H	S
CO2	H	H	S	S	H
CO3	S	S	S	H	S
CO4	H	H	H	H	H

S-Strong, H-High, M-Medium, L-Low

Course Designed by
Name and Signature

Verified by HOD
Name and Signature

Checked by
CDC

Approved by
COE

Ms. S. Jayalakshmi	Dr. S. Somasundaram	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	20BZ3053	Title:	Batch :	2020-2023
		Core Elective Paper - III	Semester	VI
		Sericulture		
Hrs/Week:	4		Credits:	3

Course Objectives

- To study the cultivation and values of mulberry.
- To acquire knowledge on the silkworm rearing and silk reeling techniques.
- To know the Central Silk Board and its functions.

Course Outcomes (CO)

K1	CO1	To remember the historical background of Sericulture and importance of agricultural production.
K2	CO2	To get the idea for increasing cocoon productivity and to prevent silkworm diseases.
K3	CO3	To execute the construction of rearing house and self employment in silkworm rearing.
K4	CO4	To analyze this course for employment and job opportunities in the public, private and Govt. sectors.

Unit	Content	Hrs
Unit I	• Definition and History of Sericulture • Economic importance of sericulture • Varieties of silkworms ○ Mulberry silk worm: Bombyx mori ○ Non-Mulberry silk worm: Tasar, Muga and Eri silk worms. • Uses of silk • Moriculture: Optimum conditions for mulberry growth • Planting direction and season • Planting systems	10 Hrs
Unit II	• Methods of vegetative Propagation ○ Cutting ○ Layering ○ Grafting • Pruning: Low cut, High cut and Rejuvenation pruning • Methods of Leaf harvesting • Preservation of leaves • Diseases of Mulberry: Fusarium Root Rot – Powdery Mildew – Leaf Blight – Leaf Moisture disease	11 Hrs
Unit III	• Life cycle of Bombyx mori • Structure of silk worm • Structure of Silk gland • Graissage • Incubation and its methods • Brushing and its methods • Bed cleaning and its methods • Silkworm rearing appliances	10 Hrs
Unit IV	• Disinfection • Rearing of young age silkworm : Chawki rearing in India • Rearing of mature larvae: Shelf-Floor and slant rearing • Mounting: Methods and precaution during mounting • Diseases of silk worms: ○ Pebrine ○ Viral Flacherie (IFV) ○ Grasserie/Nuclear Polyhedrosis (NPV)	11 Hrs

Unit V	• Indian Lizi fly (Pest of silk worm) • Physical characteristics of cocoons • <i>Defective cocoons</i> • Reeling appliance – Country Charkha • Cocoon Markets • Raw silk testing	10 Hrs
Total Contact Hrs		52

➤ *Italics denoted as self study topics*

Power point Presentations, Seminar , Assignment, Discussions, Google class room, Subject video play

Books for Study:

1. Ganga G. and Sulochana Chetty. J. (2012) An Introduction to sericulture – Oxford and IBH Publishing Co. PVT. LTD.

Books for Reference:

1. Ullal and Narasimhanna, M.N. 2nd Ed.(1981) Hand Book of practical sericulture –SBS Publishers, Bangalore
2. Manual on sericulture – FAO (1977), Central Silk Board Bangalore
3. Ezhil N. & Thirumathal K. (2008) A hand book for sericulture – Shrishti Impression, Coimbatore

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	H
CO2	H	M	H	H	H
CO3	M	H	S	M	M
CO4	M	H	H	H	H

S-Strong, H-High, M-Medium, L-Low



Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Mariselvi	Dr. S. Somasundaram	Dr. M. Durairaju	R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc.	Programme Title :	Zoology
Course Code:	2012316E1	Title	Batch : 2024-2025
		Core Elective Paper- IV	Semester VI
		Insect Pest Management	
Hrs/Week:	5	Credits:	5

Course Objectives

- To study the insect available in the agricultural field
- To know the use of biopesticides
- To acquire knowledge on pest control management

Course Outcomes (CO)

K1	CO1	To remember agricultural pest and their management
K2	CO2	To understand the control of pest management
K3	CO3	To apply modern methods in agricultural field
K4	CO4	To interpret application of pesticide

Unit	Content	Hrs
Unit I	• Pest definition – Definition - Classification • Reasons for insect pest • Insect pest out break • Injuries and Damage caused by insect pest	13 Hrs
Unit II	• Assessment of insect pest population • Assessment of insect pest damage • Pest surveillance and forecasting pest outbreak • Need for insect pest management	13 Hrs
Unit III	• Pest control • Climatic factors • Natural enemies • Physical • Mechanical • Cultural - biological and legal control	13 Hrs
Unit IV	• Insecticide- Definition - Formulation of insecticides • Classification based on modern entry • Classification based on modern action • Brief account of Attractants- Antifeedants and Chemosterilants • Integrated Pest Management	13 Hrs
Unit V	Major Local Agricultural pest and their Management • Cotton - The cotton Boll worm - <i>Helicoverpa armigera</i> • Coconut - The Rhinoceros beetle - <i>Oryctes rhinoceros</i> • Groundnut - The Red hairy caterpillar - <i>Amsacta albistriga</i> • Sugarcane - The sugarcane stem borer- <i>Chilo infuscatellus</i>	13 Hrs
Total Contact Hrs		65

➤ *Hours devoted as self study topics*

Assignment, Seminar

Books for study:

1. Chapman, R.F.(2015). The insects: Structure and Function, Hodder and Broughton Ltd., Kent, U.S.A.
2. Nalina Simarani, M.S., and R. Santhi, (2006) Entomology, MJP Publishers, Chennai

Books for Reference:

1. Mani, M.S., (1982) General Entomology, Oxford and IBH publishing Co., New Delhi.
2. Snodgrass, R.E., (1985) Principles of Insect Morphology, McGraw Hill and Co., New York.
3. Nayar, K.K., Ananthakrishnan, T.N., and David, M., (1995) General and Applied Entomology, Tata McGraw Hill Pub. Co., Ltd., New York.
4. Vasantharaj David, B., (2001) Elements of Economic Entomology, Popular Book Depot, Chennai -15.
5. Nayar, K.K. (1983) Economic Entomology and Applied Entomology, Oxford and IBH Publishing Co., New Delhi.
6. Rathnaswamy, T.K., (1986) Medical Entomology, S. Viswanathan and Co., Madras.
7. Shukla, Upadhyay (2003). Economic Zoology – Rastogi Publications, Shivaji Road, Meerut-250002, India

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	H	H	H	H	S
	CO2	S	M	H	H	H
	CO3	S	S	S	M	M
	CO4	H	H	H	M	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Mariselvi	Dr. S. Somasundaram	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc.	Programme Title :	Zoology
Course Code:	20W2YH13	Title	Batch : 2020-2023
		Core Elective Paper- V Aquaculture	Semester VI
Hrs/Week:	5		Credits: 5

Course Objectives

- To study the nature and habitat of different aquatic animals.
- To acquire knowledge on fresh water and marine water fishes
- To know the preparation of fish feed

Course Outcomes (CO)

K1	CO1	To keep in mind the environmental assessment strategies and management systems
K2	CO2	To deduce the techniques involved in the culture of various organisms
K3	CO3	To apply the knowledge in food sector, hatchery and nursery operations
K4	CO4	To sort of the structure and functions of aquatic ecosystems.

Unit	Content	Hrs
Unit I	- Scope of Aquaculture - Aquaculture in India - General character and adaptations in fishes - General Organization of fish - Teleost - <i>Labeo rohita</i> - Morphology and anatomy - Digestive system - Reproductive system - Economic importance of fish / Nutritive value of fish - Pond culture- different kinds of fish ponds in a model fish farm	13hrs
Unit II	- Culture methods - mono culture, poly culture & integrated culture - Fresh water culture - Marine culture - Fish feed - Classification & Composition of feed - Live feed	13hrs
Unit III	- Bionomics of some important aquatic animals - Fresh water fishes: - Indian major carps- <i>Catla catla</i> <i>Cyprinus carpio</i> <i>Labeo rohita</i> - Exotic fishes - Common carp - Tilapia - Marine fish-Oil Sardine - Prawn culture - Oyster culture - Pearl culture	13hrs
Unit IV	- Fish crafts – different types of fishing boats - Gears - Hooks - Simple dipnets - Chinese dipnets - Gill nets - Purse seine - Trawl nets	13hrs

	- Fish processing - Identification of good and spoiled fish - Refrigeration - Freeze drying - Fumigation - Canning - Salting	
Unit V	- Ornamental fish culture - Requirements and setting of an aquarium - Aquarium fishes - Fish pathology and major diseases - Bacterial diseases- Dropsy, Gill Rot - Viral diseases - Ebizootic ulcerative syndrome, Haemorrhagic septicaemia - Fungal diseases - Gill Rot, Saprolegniasis - Fish parasites - Icthyocephalus - Principles of harvesting, transport and marketing - By-products of fishes - Role of fishes in mosquito control - Transgenic fishes	13hrs
Total Contact Hrs		65

➤ *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Case study

Books for Study:

- Arumugam, N. (2019) Aquaculture SARAS Publications, Nagercoil, Tamilnadu.
- Shanmugham, K. (1992) Fishery biology and aquaculture, LEO Pallappagam, Madras.

Books for Reference:

- Vadapalli and Setyanarayana, (1996) Fish culture, Narendra publishing house, Delhi.
- Datta Munshi and Srivastava, (1988) Natural history of fishes and systematic of Fresh-water fishes of India, Narendra Publishing House, New Delhi.
- Jordan E. L. and Verma, P. S. (2000) Chordate Zoology, S. Chand and company LTD, New Delhi
- Agarwal, S. C. (1998) A hand book on fish farming, Narendra publishing house, Delhi
- Pandey and Shukla, (2010) Fish and fisheries, Rastogi publication
- Charis L Cutting, (1999) Fish processing and preservation, Agrobolical publishers (India)
- ICAR Publication (2006) 1st edition, Hand book of fisheries and aquaculture, Directorate of information and publications of agriculture, Indian Council of Agricultural Research, New Delhi
- Jhingran, V. G. 1988, Fish and Fisheries of India - Hindustan Publishing Corporation India Delhi, Printed in India at Gopsons paper Pvt. Ltd. Noida

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	H
CO2	H	M	H	S	H
CO3	M	H	S	M	M

CO4	M	H	H	H	H
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S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature		Verified by HOD Name and Signature		Checked by CDC		Approved by COE	
Dr. S. Christobher		Dr. S. Somasundaram		Dr. M. Durairaju		Dr. R. Muthakumaran	
Signature:		Signature:		Signature:		Signature:	
Programme code:	B. Sc	Programme Title :			Zoology		
Course Code:	20UZY6E7	Title			Batch :	2020-2023	
		Core Elective Paper – VI Wildlife Conservation			Semester	VI	
Hrs/Week:	5				Credits:	5	

Course Objectives

- To understand the basic principles of wildlife and its conservation.
- To learn the knowledge about wildlife conservation techniques.
- To improve the knowledge about forest types and biodiversity conservation values.

Course Outcomes (CO)

K1	CO1	To remember the importance of wildlife and its management techniques
K2	CO2	To understand the methods used in wildlife census.
K3	CO3	To apply knowledge about conservation on Indian wildlife.
K4	CO4	To analyse and estimate different animal population and prioritize its conservation.

Unit	Content	Hrs
Unit I	Scope and importance of Wildlife of India. Definition of Wildlife- Causes of wildlife depletion- Economic importance of wildlife, need for wildlife conservation, rare, endangered, threatened and endemic species of fishes, amphibians, reptiles, birds and mammals in India: <i>India as a mega wildlife diversity country</i>	13Hrs
Unit II	Forestry and forest entomology. Forest types in India- identification, dendrology, Deforestation & Impacts; Forest Inventory; Natural and artificial regeneration of forests; Harmful insects and their role in forest economy; Insect pests of important trees of India -Teak, Sal and Bamboo; Beneficial insects and their role in forest economy- Scavenger insects dung beetles; Pollinators; Predatory insects, and parasitic insects or insect pests; control of forest insects	13Hrs
Unit III	Wildlife management techniques: Vegetative analyses- Point-Centered Quadrat, Quadrat, Strip transect, GIS and Remote sensing in wildlife habitat surveys-Habitat manipulation: food, water, shade improvement; impact and removal of invasive alien species; Making observations and records: field notes, datasheets, Wildlife Photography- Types of cameras; camera traps; Field equipments-altimeter, pedometer, field compass, binoculars; radio collaring; GPS; GIS; Remote sensing in Wildlife management.	13Hrs
Unit IV	Wildlife census techniques: Planning census - Total counts - Sample counts - Basic concepts and applications - Direct count (block count, transect methods, Point counts, visual encounter survey, waterhole survey); Indirect count (Call count, track and signs, pellet count, pugmark, camera trap)-Identifying animals based on indirect signs- Capture-recapture techniques.	13Hrs
Unit V	Conservation of Wildlife: in-situ and ex-situ conservation. <i>Wildlife Sanctuaries, National Parks, Tiger Reserves and Biosphere reserves</i> - Definition, formation, management and administration. Wildlife Projects: Tiger, Elephant, Lion and Hangul. Zoos and Zoological Parks: Definition- Aims of Zoos- Formation and Management of Zoos and Zoological Parks - Central Zoo Authority of India, Captive	13Hrs

	breeding: Aims, Principles, methods; Role of Government and Non-Governmental organizations in conservation.	
Total Contact Hrs		65

➤ *Italics denoted as self study topics*

➤ Assignment , Seminar , Power point presentation

Books for Study:

1. K.V. Krishnamurthy (2017) An advanced text book on Biodiversity, principles, and practice, Oxford [BH Publishing company private limited, New Delhi
2. Anne E Magurran (1988). Ecological diversity and its measurement. Springer Netherlands

Reference

1. P.K. Maiti and P Maiti (2011). Biodiversity perception, Peril, and Preservation. PHL Learning private Ltd., New Delhi
2. D. Kar (2010). Biodiversity Conservation prioritization. Swastik publications, New Delhi.
3. Prathipsingh (2007). An introduction to biodiversity. ANE Books India , New Delhi
4. Asish Ghosh (2003). Natural resource conservation and environment management. APH Publishing Corporation, New Delhi
5. B.S. Badan and Harish Bhatt (2007). Ecotourism. Commonwealth Publishers, New Delhi
6. K.P.Singh and J.S.Singh (EDS): (1991) Tropical ecosystem, ecology and management Willey eastern limited, New Delhi.

Mapping

CO	PS0	PS01	PS02	PS03	PS04	PS05
	CO1	S	H	H	H	S
	CO2	H	H	S	S	H
	CO3	H	S	S	H	H
	CO4	S	H	H	H	S

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Somasundaram	Dr. M. Durairaju	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	20UZY 666	Title	Batch :	2020-2023
		Core Elective Paper-VI Dairy Farming and Management Technology	Semester	VI
Hrs/Week:	5		Credits:	5

Course Objectives

- To know about the basic processing technology in dairy farm.
- To get idea about manufacturing technology of ice-cream and frozen desserts.
- To understand the physico chemical properties of dairy products.

Course Outcomes (CO)

K1	CO1	To keep in mind the dairy by-products.
K2	CO2	To deduce the Breeding practices in dairy farm.
K3	CO3	To apply the knowledge in Production of condensed and dried milks.
K4	CO4	To sort of the Food safety and quality assurance.

Unit	Content	Hrs
Unit- I	• Scope of dairy farming • Dairy progress at India • Milk and Milk Products • Nutritive value of milk • ICMR recommendation of nutrients • Milk production in India and Tamil Nadu • Role of milk and milk products in human nutrition.	13Hrs
Unit -II	QUALITY ANALYSIS OF MILK: • Determination of Specific gravity, fat, Acidity & pH in milk • Significance of milk • Determination and significance common adulterants in milk and their detection techniques • Advanced analytical techniques in milk and milk products.	13Hrs
Unit -III	DAIRY HUSBANDRY: • Dairy Cattle Breeds • Indigenous and -exotic Breeds - Dairy Cattle - Anatomy • Nutrition - Physiology - Genetics and Breeding - AI • Health and Hygiene Vaccination schedule	13Hrs
Unit- IV	DAIRY CHEMISTRY: • Milk Composition • Physico Chemical properties of milk • Animal, Feed and Environmental factors influencing the composition of milk • Milk lipids, Proteins, Sugar, Minerals and vitamins DAIRY MICROBIOLOGY: • Milk and microbes - Common micro organisms in milk • spoilage of milk	13Hrs

	• Fermentation of milk – Desirable and undesirable fermentation • Milk borne diseases • Clean milk production	
Unit-V	DAIRY PROCESSING AND TECHNOLOGY: • Dairy processing – Milk collection, transportation & Grading of milk • Standardization – Pasteurization – Homogenization of milk - packaging of milk – cleaning and sanitation • Butter – ghee and Ice cream • Concentrated and dried milk products • Cheese and other fermented products • Indigenous milk products • Effective utilization of dairy by - products	13Hrs
Total Contact Hrs		65

Reference Books

1. Hamarjee G.C. (1998) A Text book of Animal Husbandry: S CHAND Publications, Oxford & Co. Publishing Pvt. Ltd.

Books for Reference

1. Varnam, A., Sutherland, Jane P. (1994) Milk and Milk Products Technology, chemistry and microbiology publishers, Springer, U.S
2. Lampert (1998) Modern Dairy Products Chemical Publishing Co Inc., U.S.: 3 edition
3. Gupta P.R. Dairy India Year Book – (2007-b)
4. Schmitt G. H., Van sleet L. D. and Hutjens M. F. (1988) Principles of Dairy Science Subsequent edition
5. Eri Board (2008) Handbook of Dairy Farming: To Produce Milk with Packaging Engineers India Research Institute
6. John L. Curtis (1992) Cattle Embryo Transfer Procedure Academic Press Inc.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	H
CO2	H	M	H	S	H
CO3	M	H	S	M	M
CO4	M	H	H	H	H

S-Strong, H-High, M-Medium, L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Christobher	Dr. S. Somasundaram	Dr. M. Durairam	Dr. R. Muthakumar
Signature: _____	Signature: _____	Signature: _____	Signature: _____

Programme code:	B. Sc.	Programme Title :	Zoology	
Course Code:	200/ZY657	Title	Batch :	2020-2023
		Vermiculture (SBE)	Semester	VI
Hrs/Week:	1		Credits:	2

Course Objectives

- To study the importance of vermiculture
- To acquire the knowledge on nutrient value of vermicompost
- To understand the methods and preparation of vermicom

Course Outcomes (CO)

K1	CO1	To remember the role of worm farming in Modern Farming
K2	CO2	To understand Economic importance of vermiculture
K3	CO3	To deploy role of Vermiculture in protecting the environment and managing the waste
K4	CO4	To analyze the potential of vermicompost as an alternative to chemical fertilizers

Unit	Content	Hrs
Unit I	• Systematic position of Earthworm – Habitat and Habitat - Commercial varieties of Earthworm for Vermicomposting ◦ <i>Economic importance of Earth worm</i>	3Hrs
Unit II	• Type study: Earthworm: <i>Megascolex</i> sp. ◦ External character ◦ Digestive system ◦ Respiratory system ◦ Excretory system	3Hrs
Unit III	• Life cycle of Earthworm • Collection of earth worms • Methods of vermicomposting • Types of soil	2Hrs
Unit IV	◦ <i>Indian Vermicomposting</i> ◦ <i>Precautions need for Vermicomposting</i> ◦ Biodegradable wastes ◦ Nutrient Content of vermicompost	2Hrs
Unit V	◦ Preparation of Vermicom ◦ Maintenance of Composting pit ◦ Collection of vermicompost ◦ <i>Vermiwash</i> ◦ Marketing of vermicompost	3Hrs
Total Contact Hrs		13

- *Italic denoted as self study topics*

Power point Presentations, Seminar, Assignment, Case study

Books for study:

1. Seethalakshmi M. and Santhi R. (2012) Vermitechnology, Saras publication, Nagercoil, Tamilnadu
2. Nair N.C., Leclavathy S., Soundarapandian N and Arunugam, N. (2018) A text book of Invertebrates – Saras Publication, Nagercoil, Tamilnadu

Books for Reference:

1. Ekambaranatha Iyyer, (1990) A Manual of Zoology, Part I & II, Invertebrata, Revised edition. S. Viswanathan(Printers and Publishers)
2. Odum, E. P (1971) Fundamentals of ecology W.B. Sanders Company, London
3. Gupta. P. K. (2005) Vermicomposting for sustainable agriculture. Agrobios. Jodhpur. India
4. Rana. S. V. S. (2010) Environmental biotechnology. Rastogi Publication. Meerut, India
5. Aravind Kumar. (2005) Verms and vermitechnology APH Publishing co-operation.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	H	H
CO3	M	H	H	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. S. Sumasundaram	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc.	Programme Title :	Zoology
Course Code:	201231684	Title	Batch : 2024-2024
		Biopharmaceuticals (S06)	Semester IV
Hrs/Week:	1	Credits:	2

Course Objectives

- To enable the students to know the actual path of metabolism of drugs and drug discovery

Course Outcomes (CO)

K1	CO1	To keep in mind the Routes of administration in biological systems and models
K2	CO2	To understand the drug metabolism
K3	CO3	To implement the microbial products in pharmaceutical industry
K4	CO4	To discuss the DNA technology in Pharmaceutical products

Unit	Content	Hrs
Unit I	• Biological systems and models Routes of administration- adsorption enhancement- bioavailability- site specific delivery. Pharmacodynamics of protein therapeutics- inter species scaling	3hrs
Unit II	• Drug metabolism: Oxidation- reduction- hydrolysis- conjugation. Need for developing new drugs. Procedure followed in drug design. Prodrug and soft drugs. Drug toxicity	3hrs
Unit III	• Drug discovery & cardiovascular drugs: Substances derived from bacteria- plants- insects- and animals. Sources of active principles; drugs used in atherosclerosis	3hrs
Unit IV	• Pharmaceutical products: Microbial products - Antibiotics (penicillin- streptomycin- tetracycline)- vitamins - probiotics. Animal vaccines- Anti parasites drugs	2hrs
Unit V	• Quality assurance and quality control Fundamentals of quality assurance, Good's practices of quality management, documentation, quality assurance in manufacturing	2hrs
Total Contact Hrs		13

➤ *Italics denoted as self study topics*

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|---|
| <ul style="list-style-type: none"> • Assignment, Seminar |
|---|

Books for Reference:

1. Heinrich Klefenz, (2002) Industrial Pharmaceutical Biotechnology, WILEY-VCH Publication, Germany.
2. Dean Crommelin and Robert D Stodeler, (2002) Pharmaceutical Biotechnology, Taylor and Francis Publications, New York.
3. Jay P Rho and Stan G Louie, (2003) Hand book of Pharmaceutical Biotechnology, Pharmaceutical products press, New York.
4. Lachman L, Lieberman, HA, and Kanig, J, (1986) Theory and practice of industrial pharmacy, 3rd edition, Varadose publishing & Co, New Delhi.
5. Remington's Pharmaceutical sciences, (2000) 18th edition, Mack publishing & Co., Easton, PA

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		S	S	M	H	S
CO2		H	M	H	H	H
CO3		M	S	S	M	M
CO4		M	H	H	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature Dr. S. Somasundaram	Verified by HOD Name and Signature Dr. S. Somasundaram	Checked by CDC Dr. M. Durairaju	Approved by COE Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

DEPARTMENT OF ZOOLOGY

B.SC. ZOOLOGY SYLLABUS

BATCH: 2019-2022

FACULTY MEMBERS

Dr. M. Durairaju, M.Sc., M.Phil., B. Ed., PGDGC., Ph.D. (HOD)

Dr. S. Somasundaram M.Sc., B. Ed., Ph.D., P.G.MBT

Ms. S. Mariselvi, M.Sc., M.Phil., PGDCA., Ph.D.

Ms. S. Jayalakshmi, M.Sc., M.Phil., Ph.D.

Dr. S. Christobher, M.Sc., B. Ed., Ph.D.,



Nallamuthu Gounder Mahalingam College

An Autonomous Institution Affiliated to Bharathiar University

Accredited with 'A' Grade by NAAC

An ISO 9001:2015 Certified Institution

Pollachi - 642 001

Coimbatore (Dt.) Tamil Nadu

Nallamuthu Gounder Mahalingam College

Vision

Our dream is to make the college an institution of excellence at the national level by imparting quality education of global standards to make students academically superior, socially committed, ethically strong, spiritually evolved and culturally rich citizens to contribute to the holistic development of the self and society.

Mission

Training students to become role models in academic arena by strengthening infrastructure, upgrading curriculum, developing faculty, augmenting extension services and imparting quality education through an enlightened management and committed faculty who ensure knowledge transfer, instill research aptitude and infuse ethical and cultural values to transform students into disciplined citizens in order to improve quality of life.

DEPARTMENT OF ZOOLOGY

Vision

Enlightening the students with total dedication to bring out the hidden skills, creativity and human excellence with due emphasis on knowledge about recent development in the field of biology and mould them as responsible citizens.

Mission

Metamorphosing the students holistically through seminars, symposia, guest lectures, group discussions, shared class experiences, assignments, nature club, job opportunities, and healthy practices to express the excellence within.

Scheme of Examination

Part No	Course Code	Course title	Lecture+ Practical Hours/ week	Duration of Exam Hrs	Max. Marks			Credit Point
					Internal	End-of-Semester	Total	
Semester I								
I	19UTL101	Tamil/Hindi Paper - I	6	3	25	75	100	3
II	19UEN101	English Paper - I	5	3	25	75	100	3
III	19UZY101	Core Major Paper - I Non-Chordata	7	3	25	75	100	4
		Practical - I (Non-Chordata & Chordata)	2	-	-	-	-	-
	19UBY1A1	Auxiliary Zoology Paper-I (Non-Chordata & Chordata)	6	3	25	75	100	4
		Auxiliary Zoology Paper - I (Paper - I & II)	2	-	-	-	-	-
IV	19UHR101	Human Rights	1	2	-	50	50	3
	19HEC101	HE - (Personal values & SKY Yoga practice - I)	1	2	25	25	50	1
V	19UNC401/ 19UNS 402/ 19USG 403	NCC NSS Sports & Games						
							500	17
Semester II								
I	19UTL202	Tamil/ Hindi Paper - II	6	3	25	75	100	3
II	19UEN202	English Paper - II	5	3	25	75	100	3
III	19UZY202	Core Major Paper - II Chordata	5	3	25	75	100	4
	19UZY203	Major Practical - I (Non-Chordata & Chordata)	2	3	40	60	100	4
	19UBY2A2	Auxiliary Zoology Paper - II Economic Zoology	6	3	25	75	100	4
	19UBY2A3	Auxiliary Zoology Paper - II (Paper - I & II)	2	3	40	60	100	2
IV	19EVS201	Environmental Studies	2	2	-	50	50	2
	19HEC202	HE - Family values SKY Yoga practice - II	1	2	25	25	50	1
V	19UNC401/ 19UNS 402/ 19USG 403	NCC NSS Sports & Games						
							700	23
Semester III								
I	19UTL303	Tamil/ Hindi Paper - III	5	3	25	75	100	3
II	19UEN303	English Paper - III	6	3	25	75	100	3
III	19UZY304	Core Major Paper - IV Cell Biology	7	3	25	75	100	4
		Major Practical - II Cell biology & Genetics	2	3	-	-	-	-
	19UZY3A4	Auxiliary Chemistry Paper - I	6	3	25	75	100	4
		Auxiliary Chemistry Practical	2	-	-	-	-	-

IV	19UZY3N1 / 19UZY3N2	Public health and hygiene (NME) / Ornamental fish culture (NME) / Basic Tamil paper / AD Tamil paper	1	2	-	50	50	2
	19HEC303	HE - (Professional values & SKY Yoga practice -III)	1	2	25	25	50	1
V	19UXX401 to 19UXX 413	See Annexure -I						
							500	17
Semester IV								
I	19UTL404	Tamil/ Hindi Paper - IV	5	3	25	75	100	3
II	19UEN404	English Paper - IV	6	3	25	75	100	3
III	19UZY405	Core Major Paper -V Genetics	7	3	25	75	100	4
	19UZY406	Major Practical - II Cell biology & Genetics	2	3	40	60	100	4
	19UZY4A5	Auxiliary Chemistry Paper - II	6	3	25	75	100	4
	19UZY4A6	Auxiliary Chemistry Practical	2	3	40	60	100	2
IV	19UZY4N3/ 19UZY4N4	Food and nutrition (NME) / Apiculture (NME) / Basic Tamil paper/AD Tamil paper	1	2	-	50	50	2
	19HEC404	HE - (Social values & SKY Yoga practice -IV)	1	2	25	25	50	1
V	19UXX401 to 19UXX 413	See Annexure -I				50	50	1
							750	24
Semester V								
III	19UZY507	Core Major Paper - VII Developmental Biology	5	3	25	75	100	4
	19UZY508	Core Major Paper - VIII Biotechnology	5	3	25	75	100	4
	19UZY509	Core Major Paper - IX Biostatistics & Biophysics	5	3	25	75	100	4
	19UZY617	Major Practical - III Developmental biology, Animal Physiology & Endocrinology, Biostatistics & Biophysics, Bioinformatics & Biochemistry and MLT	2	-	-	-	-	-
	19UZY618	Major Practical - IV Ecology, Evolution, Biotechnology, Microbiology Sericulture and Aquaculture	2	-	-	-	-	-
	19UZY510	Core Elective Paper I Medical Laboratory Technique	4	3	25	75	100	5
	19UZY511	Core Elective II Bioinformatics and Biochemistry	5	3	25	75	100	5

IV	19UZY551	Cyber Security (SBE) (online)	1	2	-	50	50	2
	19GKL501	General Knowledge & General Awareness (SBE) (online)	SS	2	-	50	50	2
	19HEC505	HE - (National values & SKY Yoga practice -V)	1	2	25	25	50	1
							650	25
Semester VI								
III	19UZY612	Core Major Paper – XII Animal Physiology & Endocrinology	5	3	25	75	100	5
	19UZY613	Core Major Paper – XIII Ecology & Evolution	5	3	25	75	100	4
	19UZY614	Core Major Paper – XIV Microbiology & Immunology	5	3	25	75	100	4
	19UZY615	Core Major Paper – XV Sericulture	4	3	25	75	100	3
	19UZY616	Core Elective – III Aqua culture	5	3	25	75	100	5
	19UZY617	Major Practical – III Developmental biology & Endocrinology, Biostatistics & Biophysics, Animal Physiology & Biochemistry and MLT	2	3	40	60	100	4
IV	19UZY618	Major Practical – IV Ecology, Evolution, Biotechnology, Microbiology Sericulture and Aquaculture	2	3	40	60	100	4
	19UZY652	Vermiculture (SBE)	1	2	-	50	50	2
	19UZY653	Biopharmaceuticals (SBE)						
	19HEC606	HE – (Global values & SKY Yoga practice -VI)	1	3	25	25	50	1
							800	34
**Grand total							3900	140

List of Part – V Subjects

S.No	Subject Code	Subjects
1.	19 UNC 401	NCC
2.	19 UNS 402	NSS
3.	19 USG 403	Sports and Games
4.	19 URO 404	Robotics Club
5.	19 URR 405	Red Ribbon Club
6.	19 UVR 406	Youth Red Cross
7.	19 UCA 407	Consumer Awareness Club
8.	19 UED 408	Entrepreneurship Development Cell
9.	19 UCR 409	Center for Rural Development
10.	19 USS 410	Student Guild of Service
11.	19 UGS 411	Green Society
12.	19 UEO 412	Equal Opportunity Cell
13.	19 UFA 413	Fine Arts Club

General Question Pattern

Question Pattern for PART -IV

PART I, II & III

Max. Marks: 100	Internal : 25	External : 75	
Section	Pattern	Mark	Total
Part A	1-5 Multiple choice with 4 options (One question from each unit)	10X1	10
	6-10 Short answers (One question from each unit)		
Part B	11-15 Either /Or type (One question from each unit)	5X5	25
Part C	16-21 Four out of six (Question no. 16 is compulsory)	4X10	40
Total : 75			

Max. Marks: 100	External : 50		
Section	Pattern	Mark	Total
Part A	1-5 Multiple choice with 4 options	5X1	5
	6-10 Short answers (One question from each unit)	5X1	5
Part B	Answer any questions five out of eight (11-18)	5X8	40
Total : 50			

CIA Test - I : 2.5 Units

Test - II : Remaining 2.5 Units

Bloom's Taxonomy Based Assessment Pattern

K1-Remember ; K2- Understanding ; K3- Apply ; K4-Analyze ; K5- Evaluate

1. Theory: 75 Marks

(i) TEST-I & II and ESE:

Knowledge Level	Section	Marks	Description	Total
K1 & K2	A (Answer all)	10x1=10	MCQ/Define	75
K3	B (Either or pattern)	5x5=25	Short Answers	
K4	C (Answer 4 out of 6)	4x10=40	Descriptive/ Detailed	

2. Theory: 50 Marks

Knowledge Level	Section	Marks	Description	Total
K1	A (Answer all)	10x1=10	MCQ/Define	50
K2 & K3	B (Either or pattern)	5 x 8=40	Detailed Answers	

3. Practical Examinations:

Knowledge Level	Section	Marks	Total
K3	Practicals & Record work	60	100
K4		40	
K5			

Components of Continuous Assessment

Components		Calculation	CIA Total
Test 1	75	$\frac{75+75+25}{3}$	25
Test 2	75		
Assignment/Seminar	25		

Programme Outcomes

PO1. To obtain knowledge in taxonomic position of animals and know the morphology and anatomy of Non-Chordates and Chordates.

PO2. The graduates can acquire knowledge along with the hands on experience in the life or job oriented subjects like vermiculture, sericulture, apiculture, aquaculture, Medical laboratory techniques, microbiology, animal tissue culture, bioinformatics etc.

Programme Specific Outcomes

PSO1	Impart awareness of the conservation of the biosphere.
PSO2	Understand the unity of life with the rich diversity of organisms and their ecological and evolutionary significance
PSO3	To acquire knowledge in the ecological, economical and biological significance of the animals
PSO4	To develop the awareness of health and hygiene for the society
PSO5	To know the communicable, non-communicable, hereditary and major killer diseases ,

Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. M. Durairaju	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:

Programme code:	B.Sc	Programme Title :	Zoology
Course Code:	ZOO2Y161	Title	Batch : 2015-2022
		Non-Chordata	Semester : 1
Hrs/Week:	7		Credits: 4

Course Objective

- To understand the different animal groups under different phyla

Course Outcomes (CO)

K1	CO1	To remember the outline Classification of Nonchordata
K2	CO2	To understand the structure and inter-relationship between non-chordate animals.
K3	CO3	To deploy the each phylum with an example
K4	CO4	To discuss the general topics of each phylum

Unit	Content	Hrs
Unit I	Outline Classification up to class level with two examples each. General characteristics under mentioned Non-Chordate phyla (Ekambaranatha Iyer Text book to be followed) Phylum - Protozoa: <i>Plasmodium vivax</i> - structure Life cycle - Cycle of Golgi - Cycle of Ross Pathogenicity and control of Malaria Economic importance of Protozoa	16Hrs
Unit II	Phylum - Porifera: <i>Leucosolenia</i> - Structure - Reproduction and Life cycle, Canal system in sponges. Phylum - Coelenterata: <i>Obelia</i> - Structure - Reproduction and Life cycle, Polymorphism. Coral reefs - Types and Formation. Phylum - Platyhelminthes: <i>Taenia solium</i> - Structure Reproductive system and Life cycle. Parasitic adaptations in Helminth worm	16Hrs
Unit III	Phylum - Aschelminthes: <i>Ascaris lumbricoides</i> - Structure - Excretory system - Excretory system and life cycle. Economic importance of Aschelminthes. Phylum - Annelida: Earthworm - Structure - Digestive system - Excretory system and Reproductive system. Metamerism in Annelids.	15Hrs
Unit IV	Phylum - Arthropoda: Cuckroach - Structure - Mouth parts - Digestive - Respiratory - Circulatory - Nervous and Reproductive systems. Peripatus as a Connecting Link. Arthropod Vectors and Human diseases.	15Hrs
Unit V	Phylum - Mollusca: Pila - Structure Respiratory system and Reproductive Systems. Economic importance of Mollusca. Phylum - Echinodermata: Sea star - Structure - Digestive system Water vascular system and Reproductive system. Larval forms of Echinodermata and their significance	16Hrs
Total Contact Hrs		78Hrs

- *Italics denoted as self study topics*

Assignment, Seminar, Power point presentation

Books for Study:

1. Nair N.C., Leelayath S., Sundarapandian N and Arumugam, N. (2011) A text book of Invertebrates - Saras Publication, Nagercoil.

Books for Reference:

1. Ekambaranatha Iyyer, (1990) A Manual of Zoology, Part I & II, Invertebrata, Revised edition, S. Viswanathan(Printers and Publishers)
2. Jordan E.L & Verma J. K (1995) Invertebrate Zoology, S. Chand & Company, New Delhi.
3. Dhami P.S & Dhami J.K (1990) Invertebrate Zoology, S. Chand & Company
4. Ganguly B.B Sinha.A & Adhikari.S. (1977) 3rd Edition Biology of Animals, Vol -I, Invertebrates New Central Book Agencies.
5. Kotpal R. Agarwal S.K& Khetarpal R.P. (1992) 7th Edition Modern Text Book of Zoology, Invertebrata, , Rastogi Publications.

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	H	H	M	M	S
	CO2	S	M	H	H	H
	CO3	M	M	S	M	M
	CO4	H	H	M	H	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. M. Durairaju	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	1902Y203	Title	Batch : 2019-2022
		Major Practical-4	Semester I & II
		Non - Chordata and Chordata	
Hrs/Week:	2	Credits:	4

Course Objective

- To study the morphology and anatomy of invertebrates and vertebrates

Course Outcomes (CO)

K3	CO1	To remember external and internal features of organisms
K4	CO2	To understand the unity of life with the rich diversity of organisms and their ecological and evolutionary significance
K5	CO3	To evaluate the conservation awareness of the biosphere by field visit

CONTENT

- Identifying the virtual specimen exposed in monitor /dissect the virtual specimen and label it and comment on it with suitable diagram.

1. Non-Chordata – Cockroach

- External Male
- External Female
- Digestive system
- Nervous system
- Male Reproductive system
- Female Reproductive system

2. Chordata – Frog

- External
- Digestive system
- Heart
- Brain
- Limbs
- Male Urino-genital system
- Female Urino-genital system

2. SPOTTERS

A. Classify giving reasons:

- Plasmodium
- Obelia
- Taenia solium*
- Ascaris lumbricoides*
- Earth worm
- Sea star
- Shark
- Calotes
- Pigeon
- Rabbit*

B. Draw labeled sketch:

- Obelia Medusa
- T.S of *Taenia solium*
- T.S of Earthworm
- Cockroach- Mouth parts
- Frog – Pectoral girdle
- Frog – pelvic girdle
- Poison apparatus – snake
- Pigeon – Synsacrum
- Pigeon – flight muscle

10) Human Brain	
C. Biological significance:	
1) Sponge- Gemmule	
2) Corals	
3) Peripatus	
4) Limulus	
5) Bipinnaria Larva	
6) Balanoglossus	
7) Amphioxus	
8) Axolotl larva	
9) Ilyia	
10) Chamaeleon	
D. Write descriptive notes:	
1) <i>Taenia solium</i> – Scolex	
2) Earth worm – setae	
3) Penaeus	
4) Pila – Radula	
5) Rhacophorus	
6) Draco	
7) Cobra	
8) Emu	
9) Monotremes – Echidna	
10) Marsupials – Kangaroo	
3. Field Visit/Project (Select A or B option)	
The student has to maintain a log book showing the progress of the field/project work, duly signed by the supervising teacher and may be shown to the external examiner at the time of end of semester practical examination.	
A. Individual activity	
Identification of invertebrate and vertebrate species available in campus/field without disturbing the natural habitat.	
Field/project/tour report and photographs to be submitted.	
B. Group Activity	
A maximum of three students can choose any one group of activity any matter of zoological interest and submit the report for external practical examination.	
Viva	
Experiences of field visit and report preparation should be present.	
4. Record	
Total Contact Hrs	
52	
Experience: Discussion; activity, Field visit. Report Preparation	

Books for Reference:

1. Lal, S. S. (2004) A text book of Practical Zoology Invertebrate, Rastogi Publications, Shivaji Road, Meerut, 250 002, India
2. Lal, S. S. (2004) A text book of Practical Zoology Vertebrate, Rastogi Publications, Shivaji Road, Meerut, 250 002, India
3. www.froguts.com
4. www.sciencelass.com
5. www.entn.vt.edu
6. www.petaindia.com

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	C01	H	H	H	M	H
	C02	H	M	M	H	M
	C03	M	M	M	H	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by
Name and Signature
Ms. S. Jayalakshmi

Signature:

Verified by HOD
Name and Signature
Dr. M. Durairaju

Signature:

Checked by
CDC
Dr. M. Durairaju

Signature:

Approved by
COE
Dr. R. Muthukumaran

Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	17PHY1A1	Title	Batch :	2019-2022
		Ancillary Zoology Paper – I Non-chordata and chordata	Semester	1
Hrs/Week:	6		Credits:	4

Course Objective

- To study the structure and classification of different animal kingdom.
- To understand the general characters of both chordate and non-chordate phyla.

Course Outcomes (CO)

K1	CO1	To remember animal external characters and its kingdom wise classification
K2	CO2	To comprehend animal systems and its peculiar characters
K3	CO3	To execute animal general characters and classification strategies
K4	CO4	To sort of animal classification systems and its importance

Unit	Content	Hrs
Unit- I	Classification of the following Phyla up to the class level with suitable examples. Phylum: Protozoa: Paramecium – Structure- Feeding- Binary fission and Conjugation. Phylum: Coelenterata: Obelia – Structure and Life cycle.	19Hrs
Unit- II	Phylum: Platyhelminthes : <i>Taenia solium</i> – Structure - Reproduction and Life cycle. Phylum: Arthropoda: <i>Cockroach</i> – Structure- Mouthparts, Digestive system – <i>Circulatory system</i> , <i>Nervous system</i> and Reproductive system.	10Hrs
Unit- III	Phylum: Mollusca : Freshwater mussel – Structure – Digestive system- Respiratory system – Circulatory system – Reproductive system. Phylum: Echinodermata: <i>Sea star</i> – Structure and Water Vascular system.	18Hrs
Unit- IV	Phylum: Chordata Sub Phylum: Prochordata – General Characters of <i>Amphioxus</i> <i>Balanoglossus</i> <i>Ascidian</i> Sub Phylum: Vertebrata Class : Pisces <i>Shark</i> – External structure – Digestive & Urinogenital systems. <i>Mission of fishes</i> Class : Amphibia <i>Frog</i> – External structure – Respiratory system – Heart – Reproductive system.	18Hrs
Unit- V	Class : Reptilia <i>Caiman</i> – External structure – Circulatory system – Brain – Reproductive system. Class : Aves <i>Pigeon</i> – External structure – Flight muscles – Respiratory system – Reproductive system. Class : Mammal <i>Rabbit</i> – External structure – Heart – Excretory system – Reproductive system.	18Hrs
Total Contact Hrs		91

* *Italics denoted as self study topics.*

Power point Presentations, Group discussions, Seminar , Assignment, Discussion

Books for Study:

Arumugam N. (2018) Allied Zoology Part I & Part – II –, Saras Publications, 114/35 G, A.R.P Camp Road, Perlavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Ekambaranatha Iyyer (1995) A Manual of Zoology Vol. I & II, Ananda Book Depot, "Acton Lodge", Mc Nichols Road, Chetput, Madras – 600 031
2. Jordan E.L & Verma J.K. (1997) Invertebrate Zoology, S. Chand & Company Ltd, Ram Nagar, New Delhi 110055
3. Dhami P.S & Dhami J.K. (1995) Invertebrate Zoology, S. Chand & Company
4. Ganguly B.B. Sinha. A & Adhikari S. (1977) 3rd Edition Biology of Animals, Vol. –1, Invertebrates, New Central Book Agencies,
5. Kotpal R.L. (1983) Modern Text Book of Zoology, Rastogi Publications.
6. Nigam Shoban I Naginhand H.C. (1995) Biology of Non-Chordates, Shoban I Nagin hand & Co Educational & Publishers.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Christobher	Dr. M. Durairaju	Dr.M.Durairaju	Dr.R.Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	19UHY2A3	Title	Batch :	2019-2022
		Ancillary Zoology Practical – (Paper I & II)	Semester	I & II
Hrs/Week:	2		Credits:	4

Course Objective

- To study the morphology and anatomy of invertebrate and vertebrate
- To study the ecological and biological significance of the animals

Course Outcomes (CO)

K3	CO1	To remember the anatomical and morphological structure of animals and micro organisms
K4	CO2	To understand the ecological and biological importance of vertebrates and invertebrates
K5	CO3	To validate the practical efficiency in the animal kingdom structure and function

CONTENT

1. Identifying the virtual specimen exposed in monitor /dissect the virtual specimen and label it and comment on it with suitable diagram

1. Non-Chordata – Cockroach

- External Male
- External Female
- Mouth Parts of Cockroach
- Digestive system
- Nervous system
- Male Reproductive system
- Female Reproductive system

2. Chordata – Frog

- External
- Digestive system
- Heart
- Brain
- Limbs
- Male Urinogenital system
- Female Urinogenital system

2. SPOTTERS

A. Classify giving reasons:

- 1) Paramecium
- 2) *Taenia solium*
- 3) Penaeus
- 4) Sea star
- 5) Amphioxus
- 6) Calotes
- 7) Pigeon
- 8) Rabbit

B. Draw labeled sketch:

- 1) Obelia colony
- 2) *Taenia solium* – Scolex
- 3) Frog - Pectoral girdle

4) Calotes - Brain 5) Snake - Poison apparatus 6) Pigeon - Quill feather 7) Rabbit - Dentition 8) Human - Digestive system
C. Biological significances 1) Obelia Medusa 2) Balanoglossus 3) Honey bee 4) Culex mosquito 5) Earthworm 6) Salamander 7) Silkworm 8) Kangaroo
D. Write descriptive notes: 1) Paramecium - conjugation 2) Gold fish 3) Sea horse 4) Foot and mouth disease virus 5) Bird flu virus 6) Tortoise 7) Owl 8) Bat
3. Identification of fauna and report submission
4. Record
Total Contact Hrs 52

Experience Discussion, Activity, Case study

Books for Reference:

1. Arumugam .N. (2018) Practical Zoology Invertebrata Volume -I First edition. Saras publication, Nagarcovil, Kanyakumari
2. Arumugam .N. (2018) Practical Zoology Chordata Volume -II First edition. Saras publication, Nagarcovil, Kanyakumari

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Christobher	Dr. M. Durairaju	Dr. M. Durairaju	Dr. R. Muthukumarar
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc	Programme Title :	Zoology
Course Code:	1702Y302	Title	Chordata
Batch :		Semester	II
Hrs/Week:	5	Credits:	4

Course Objectives

- To acquire a basic knowledge on chordates

Course Outcomes (CO)

K1	CO1	To keep in mind the outline Classification of Chordata
K2	CO2	To understand the morphology and anatomy of vertebrates
K3	CO3	To execute interrelationship between each class
K4	CO4	To discuss the biodiversity of chordates

Unit	Content	Hrs
Unit I	General characters and outline classification of Phylum Chordata up to class level with suitable examples. (Ekambaranatha Iyer Text Book to be followed) General characters and affinities of a) Amphioxus b) Balanoglossus c) Ascidian Class: Pisces Type - Shark Systems: Externals - Digestive system - Respiratory and Urino-genital system. ❖ <i>Parental care in Fishes</i>	13Hrs
Unit II	Class: Amphibia Type - Frog Systems: Externals - Girdles and Limbs - Respiratory system - Brain - Cranial nerves and Urino-genital system. ❖ <i>Origin of Amphibia.</i>	13Hrs
Unit III	Class: Reptilia Type - Calotes Systems: Externals - Digestive system - Brain - Urino-genital system. ❖ South Indian Poisonous and Non-Poisonous Snakes ❖ Poison apparatus and biting mechanism in Snakes - <i>First-Aid for Snake Bite.</i>	13Hrs
Unit IV	Class: Aves Type: Pigeon Systems: Externals - Synsacrum - Flight muscles - Digestive system - Respiratory system - Brain - Eye and Urino - genital system. ❖ Flightless Birds ❖ Migration in Birds	13Hrs
Unit V	Class: Mammalia Type - Rabbit Systems: Externals - Brain - Brain - Digestive system - Excretory system - Reproductive system ❖ Salient features of Prototheria - Monotremes Metatheria - Marsupials Eutheria - True Placental animals	13Hrs
Total Contact Hrs		65Hrs

- Italics denoted as self study topics*

Assignment, Seminar, ppt

Books for Study:

1. Thangamani, A., Prasanna kumar, S., Narayanan, L.M., and Arumugam, N. (2018) (9th Edition) A text book of Chordata, Saras publications, 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Ekambaranatha Iyer, (1995) Manual of Zoology, Vol.II (4th Edition). S.Viswanathan PVT Ltd., Parts I & II. Viswanathan & Co.
2. Jordan, E.L. and Verma, P.S. (2006) Chordate Zoology. S. Chand & Company LTD., Ram Nagar, New Delhi. 110055.

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	H	S	M	H	H
	CO2	M	M	H	H	M
	CO3	S	H	S	M	M
	CO4	M	M	H	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. M. Durairaju	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	19UBHY2A2	Title	Batch : 2019-2022
		Ancillary Zoology Paper - II Economic Zoology	Semester II
Hrs/Week:	6	Credits:	4

Course Objective

- To understand the applications of Zoology for developing skills
- To study the ecological and economical aspects of beekeeping, silkworm rearing, poultry keeping, dairy farming aquaculture, arthropod vectors and Human diseases

Course Outcomes (CO)

K1	CO1	To remember zoological application in day to day life
K2	CO2	To get the idea of ecological and economical application of modern zoology
K3	CO3	To apply zoological knowledge in self employment and functional ecology
K4	CO4	To sort of technical, ecological and economical knowledge in the zoology

Unit	Content	Hrs
Unit-I	AQUACULTURE • Scope of Aquaculture • Types of Fisheries 1. Inland fisheries 2. Marine fisheries • Culturable organisms 1. Far fishes 2. Fishes diseases ◊ Bacteria - Erythroderma, Bacterial Gill Rot ◊ Virus - EBV, MN, VHS ◊ Fungal - Saprolegniasis ◊ Protozoan - White Spot Disease, Ichthyophthirius • Oyster culture 1. Edible oyster 2. Pearl oyster	16Hrs
Unit-II	APICULTURE • Scope of Apiculture • Brief account of <i>A. indica</i>, <i>A. mellifera</i> and <i>A. dorsata</i> • Products of Bee Keeping 1. Royal jelly 2. Honey 3. Wax 4. Bee venom DAIRY FARMING • Scope of dairy farming • A typical dairy farm[dairy house] • Dairy animals: cow • Live stock diseases 1. Mastitis 2. Foot and Mouth disease(FMD) • Nutritive value of milk • Dairy By-products	16Hrs

Unit -III	SERICULTURE • Optimum conditions for mulberry growth • Mulberry cutting preparation • Structure of silkworm • Structure of silk gland • Life cycle of <i>Bombyx mori</i> • Rearing appliances • Disinfection • Diseases of silkworm 1. Pebrine 2. Viral flacherie • Cocoon market	16Hrs
Unit- IV	POULTRY KEEPING • Construction of poultry house • Rearing of Broulers Layers • Diseases of poultry 1. Fowl pox 2. Coccidiosis 3. Ranikhet disease 4. Bird Flu • <i>Nutritive value of Egg</i>	15Hrs
Unit-V	ARTHROPOD VECTORS ➤ Head louse ➤ Bed bug ➤ Mosquito ➤ Ticks ➤ Fleas (Rat flea) HUMAN DISEASES ❖ Bacterial Diseases - Typhoid fever and Tuberculosis ❖ Viral Diseases : AIDS and Hepatitis ❖ Fungal Diseases	15Hrs
Total Contact Hrs		78

- *Italics denoted as self study topics*

Power point Presentations, Seminar , Assignment, Discussion, Case study

Books for Study:

1. Arumugam, N. (2018) Applied Zoology, Saras Publication, 114/35 G ARP Camp Road, Periyavilai, Nagercoil, Kanyakumari - 629 002

Books for Reference:

1. Ganga and Subchana Cherry, (1999) An introduction to sericulture, 2nd edition, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi
2. Arumugam, N. (2013) Economic Zoology, 1st edition, Saras Publication, 114/35 G ARP Camp Road, Periyavilai, Nagercoil, Kanyakumari - 629 002
3. Shukla & Upadhyay, (2001) Economic Zoology - Rastogi Publication, Shivaji Road, Meerut 250 002
4. Arumugam, N. (2012) Aquaculture -, 1st edition, Saras Publication, 114/35 G ARP Camp Road, Periyavilai, Nagercoil, Kanyakumari - 629 002
5. Ezhil, N. & Thirumathal, K. (2008) A hand book for sericulture, Shrishri Impression, Coimbatore

6. Tripaty, S.N. (2004) Food biotechnology. Doarinant Publishing and distributions, New Delhi. 110 002.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HoD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Christobher Signature:	Dr. M. Durairaju Signature:	Dr.M.Durairaju Signature:	Dr.R.Muthukumaran Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	19U2T304	Title:	Batch :	2019-2022
		Cell Biology	Semester	III
Hrs/Week:	7		Credits:	4

Course Objective

- To study the basic concepts of cell biology
- To acquire the basic knowledge about recent development in cell biology

Course Outcomes (CO)

K1	CO1	To remember the overview of cells and their origin and evolution.
K2	CO2	To get the fundamental ideas of prokaryotic and eukaryotic cell.
K3	CO3	To display the structure and functions of cell organelles.
K4	CO4	To sort of cell constituents and their biological activities.

Unit	Content	Hrs
Unit I	Cell Theory: Salient features - Protoplasm theory - Germplasm theory and organismal theory. Scope of Cell Biology Virus: HIV Prokaryotic Cell (E. coli bacterium) Eukaryotic Cell (Typical animal cell) Organelles: Plasma membrane Structure - Tripartite model - Biomolecular leaflet model and Fluid mosaic model. General functions of plasma membrane.	19Hrs
Unit II	Endoplasmic Reticulum: Ultra Structure - Rough and Smooth types - Functions. Ribosomes: Types - Chemical composition - Biogenesis of 70S - Function Golgi complex: Structure and Functions. Lysosomes: Polymorphism - Enzymes and Functions	18Hrs
Unit III	Mitochondria: Structure - mtDNA - Origin - General functions. Nucleus: Ultra structure of Interface nucleus and function. Nucleolus: Ultra structure and function. Chromosomes: Structure - Giant chromosomes - Polycomb and Lamp brush.	18Hrs
Unit IV	Nucleic acids DNA Structure (Watson & Crick model) - Replication of DNA (Semi-conservative model) - Types of RNA Genetic Code - Salient features Protein synthesis - Central dogma and Central dogma reverse - Mechanism of protein synthesis - Components - Transcription and Translation	18Hrs
Unit V	Cell division Cell cycle - Amitosis - Mitosis and Meiosis Cell aging - Causes - Changes and Apoptosis Cancer cells Characteristics - Properties - Types - Diagnosis - Treatment and Oncogenes.	18Hrs
Total Contact Hrs		91

- *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment,

Books for Study:

1. Arumugam N. (2018) Cell Biology — Saras Publication, 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PD, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Verma P.S.& Agarwal V.K. (1993) Cytology-S.Chand & Company LTD. Ram Nagar, New Delhi - 110055
2. Verma P.S.& Agarwal V.K (2006) Cell Biology , Genetics, Molecular Biology, Evolution and Ecology-S.Chand & Company LTD. Ram Nagar, New Delhi -110055
3. Singh & Tomar, (2008). 9th revised edition Cell Biology –Rastogi Publications, Shivaji road, Meerut – 250 002, India.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	M
CO2	H	M	H	M	H
CO3	M	H	H	M	M
CO4	M	H	H	M	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Mariselvi	Dr. M. Durairaju	Dr.M.Durairaju	Dr.R.Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc.	Programme Title :	Zoology	
Course Code:	19UZY406	Title	Batch :	2019-2022
		Major Practical – II: Cell Biology and Genetics	Semester	III & IV
Hrs/Week:	2		Credits:	4

Course Objective

- To know the measurements of microscopic objects.

Course Outcomes (CO)

K3	CO1	To keep in mind for identify the different stages of mitosis.
K4	CO2	To understand the concepts of genetics through experiments.
KS	CO3	To access the practical experience in instrument handling.

Syllabus

Content	Hrs
EXPERIMENTS - Measurements of cell using - Stage Micrometer and Ocular Micrometer - Squash preparation from Onion - Root tip - Mitosis - Identification of squamous epithelial cells in buccal smear. - Human Traits survey and gene frequency calculations. - ABO Blood grouping in man - Slide method. - Probability Test - Two coin tossing experiment. - Law of Segregation - Using color beads. - Law of Independent Assortment - Using color beads. SPOTTERS: CELL BIOLOGY - Human Immuno Deficiency Virus. E. coli Bacterium - A typical animal cell - Interface Nucleus - Lamp brush chromosome - Mitosis - stages - Meiosis - stages - DNA - Watson & Crick Model GENETICS - Drosophila - Male and Female - Gynandromorph - Hairy Pinna - Twins - Erythroblastosis Foetalis - Klinefelter's Syndrome - Down Syndrome - Turner's Syndrome - Free - martin - Sickle cell anemia	
Record	
Total Contact Hrs	52

Practical Experience, Activity

Books for Reference:

1. Jaysura and Arumugam. N (2017) Practical Zoology Vol.3 Saras Publication, Nagarcovil, Tamil Nadu
2. Lal, S. S. (2008). A text book of Practical Zoology. Rastogi Publications, Shivaji Road, Meerut.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	H	H
CO2	H	M	H	M	H
CO3	M	M	M	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Mariselvi	Dr. M. Durairaju	Dr.M.Durairaju	Dr.R.Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc.	Programme Title :	Zoology	
Course Code:	11/047YEN1	Title	Batch :	2019-2022
		Public Health and Hygiene[NME]	Semester	III
Hrs/Week:	1		Credits:	2

Course Objectives

- To study the importance of health and hygiene for the society

Course Outcomes (CO)

K1	CO1	To remember the Health awareness
K2	CO2	To understand the communicable and non-communicable diseases
K3	CO3	To implement the Pollution free environment
K4	CO4	To discuss the importance of nutrition

Unit	Content	Hrs
Unit I	• Introduction to public health • Health indicators Personal hygiene, Public health • Health Dynamics of disease transmission – host, vectors and environment	3Hrs
Unit II	• Concepts of Health and diseases • Nutrition and Health Classification of food (Macro & Micro nutrients) • Nutritional deficiencies Vitamin and Mineral deficiencies • Balanced diet	3Hrs
Unit III	• Blood borne diseases – Hepatitis B and Hepatitis C • Kidney stone • Lipid deficiency diseases • Protein deficiency diseases	2Hrs
Unit IV	• Communicable diseases Measles, Cholera, Amoebiasis, Malaria, Filariasis, AIDS • Non-Communicable Diseases Coronary heart Disease, Diabetes, Obesity, Stroke and Cancer	2Hrs
Unit V	• Health Education: Health care services in India Health Planning and Programmes in India Role of World Health Organization (WHO) in health education and Global health council • First Aid and Nursing Methods, Dressing, Care & Duties.	3Hrs
Total Contact Hrs		13

- *Italicized denoted as self study topics*

Assignment, Seminar, power point

Books for Reference:

- 1) Park and Park (1995) Text book of Preventive and Socio Medicine, M/S. Banarsidas Bhanot Publishers, Jabalpur
- 2) Verma S. (1998) Medical Zoology, Rastogi Publications, New Delhi
- 3) Jordan, K.L. and Verma, P.S. (1995) Invertebrate Zoology, 12th edn, Sultan Chand & Co

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	C01	H	S	H	H	S
	C02	H	H	H	S	H
	C03	H	S	S	M	H
	C04	S	H	H	H	S

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature Ms. S. Jayalakshmi Signature:	Verified by HOD Name and Signature Dr. M. Durairaju Signature:	Checked by CDC Dr. M. Durairaju Signature:	Approved by COE Dr. R. Muthukumaran Signature:
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Programme code:	B.Sc	Programme Title:	Zoology	
Course Code:	190702N2	Title	Batch I	2019-2022
		Ornamental Fish Culture (NME)	Semester	III
Hrs/Week:	1		Credits:	2

Course Objective

- To study the various ornamental fishes and its culture

Course Outcomes (CO)

K1	CO1	To recollect the general ornamental fishes
K2	CO2	To understand the scope of fish culture
K3	CO3	To apply the ornamental fish culture methods for aquarium maintenance
K4	CO4	To review the different types of cultural methods

Unit	Content	Hrs
Unit I	- Scope of ornamental fish culture - General characteristic of fish - General structure of fish - Digestive system - Reproductive system	3Hrs
Unit II	- Materials, equipment required for aquarium - Construction of home aquarium - Structure and location of home aquarium	3Hrs
Unit III	- Selection of fish for home aquarium - Common aquarium fishes	2Hrs
Unit IV	- Fish feed - Natural fish feed - Artificial fish feed - Maintenance of home aquarium	2Hrs
Unit V	- Common disease of ornamental fishes - Fish parasites and control - Bioremedius for fish disease - Ornamental fish breeding, cum rearing unit for entrepreneurs	3Hrs
Total Contact Hrs		13

- Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment

Books for Study:

- Arumugam, N. (2015) Aquaculture SARAS Publications, Nagercoil, Tamilnadu.

Books for Reference:

- Dhote, A.K. (1989) Publication Department – NCERT – 55 Inland fishery – Instructional – cum – Practical – Manual Vol IV Aquaculture.
- Agarwal, S.C. (1994) A hand book of fish farming, B.H. Enterprises, New Delhi
- Biswas, K. P. (1996) A Text book of fish & Fisheries Technology, Calcutta (W.B) 2nd Edition, Published by Narendra Publishing house, Delhi
- Bhingran, V. G. (1988) Fish and Fisheries of India. – Hindustan Publishing Corporation (India) Delhi, Printed in India at Gopsons papers Pvt Ltd, Noida.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
C01	H	S	M	H	S
C02	H	M	H	S	H
C03	M	S	S	M	M
C04	M	H	H	M	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Christolher Signature:	Dr. M. Durairaju Signature:	Dr.M.Durairaju Signature:	Dr.R.Muthukumaran Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	19DZT405	Title	Batch :	2019-2022
		Genetics	Semester	IV
Hrs/Week:	5		Credits:	4

Course Objective

- To Study the basic concepts of hereditary and variations.

Course Outcomes (CO)

K1	CO1	To keep in mind the genetic disorders in man.
K2	CO2	To understand the chemical basis of heredity.
K3	CO3	To deploy the heritable traits in families and populations.
K4	CO4	To sort of genetic concepts including health and diseases

Existing Syllabus

Unit	Content	Hrs
Unit I	- Mendel's monohybrid and dihybrid experiments - Mendel's Laws - Problems. Interaction of genes - Lethal genes Epistasis - Polygenic inheritance; Skin colour in man 1:4:6:4:1 Multiple alleles - Coat colour in Rabbit - ABO blood groups in man - Rh factor - problems	19Hrs
Unit II	Linkage Complete and incomplete linkage Chromosome maps: Interference and Coincidence - chromosome map in <i>Drosophila</i> (Three Point Cross) Sex determination: - XX - XY type - Man - ZZ - ZW type - Fowl - Bridge's genic balance theory - Hymenopterous type - Honey bee - Gynandromorph - <i>Drosophila</i> - Hormonal control - Free Martin Cattle.	18Hrs
Unit III	Sex linked inheritance - Eye colour in <i>Drosophila</i> - Haemophilia and colour blindness in man - problems Variation in chromosome number Euploidy and Aneuploidy Syndromes - Autosomal - Down syndrome and Patau's syndrome. - Allosomal - Klinefelter's syndrome and Turner's syndrome	18Hrs
Unit IV	- Pedigree analysis - Twins. Inborn Errors of metabolism - Phenylketonuria - Alcaptonuria - Albinism Eugenics - Positive - Negative	18Hrs

Unit V	Nucleic acids as genetic material DNA and RNA. Mutation:Detection of mutations – CIB method in <i>Drosophila</i> - Molecular basis of gene mutation – Substitution mutations and Frame shift mutations Population Genetics - Gene pool - Gene frequency and genotype frequency - Hardy-Weinberg law.	18Hrs
Total Contact Hrs		91

• *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment

Books for Study:

1. Mayyan R. P. (2017) 11th Edition, Genetics – Saras Publications, 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Mital G. S. (2002) 1st edition, Advanced Genetics, Narosa Publishing House, New Delhi, 110002.
2. Russell, J. (1987) 2nd edition, Essential Genetics, Black well Scientific Publication London
3. Verma and Agarwal (2008) 3rd edition, Genetics, S. Chand & Company, Ltd, New Delhi, 110055
4. Veer Bala Rastogi. (2008) 9th edition, A text book of genetics, Kendra Nath, Meerut.
5. Gupta, P. K. (2007) 3rd edition, Genetics, Rastogi Publication, Meerut.
6. Kottari, L. et al., (2009) 5th edition Essentials of Human Genetics, University Press Private Ltd, Hyderabad, 500029.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	H	H
CO2	H	M	H	M	H
CO3	M	M	M	M	M
CO4	M	H	H	M	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by COC	Approved by COE
Ms. S. Mariselvi	Dr. M. Durairaja	Dr.M.Durairaja	Dr.R.Mulhukumar
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc	Programme Title :	Zoology
Course Code:	19UCZAN2	Title	Batch : 2019-2022
		Food and Nutrition (NME)	Semester IV
Hrs/Week:	1		Credits: 2

Course Objective

- To understand the nutritive Values of various foods

Course Outcomes (CO)

K1	CO1	To recollect the concept of nutritive foods.
K2	CO2	To understand the energy values of various foods.
K3	CO3	To apply the importance of food chart.
K4	CO4	To analyze the food deficiency diseases

Unit	Content	Hrs
Unit I	- The scope of food and nutrition - Composition of food (Protein –Carbohydrate – Fat-Vitamins and Minerals) - Function and sources of food.	3Hrs
Unit II	- Measurement of energy and energy values of various food - Nutritional requirements – children, adolescence, old age - Balances diet <i>Digestion and absorption</i>	3Hrs
Unit III	- Milk – Types – importance in the diet - Eggs – Structures and composition – importance in the diet - Meat – Types – importance in the diet	2Hrs
Unit IV	- Fish – Types - importance in the diet - Vegetables – Types - importance in the diet - Fruits – Types - importance in the diet - Cereals and pulses – Types- importance in the diet	2Hrs
Unit V	- Food spoilage - Food poisoning- food borne diseases - Food adulteration <i>Methods of purification of potable water</i> - Food laws	2Hrs
Total Contact hrs		13

- Italics denoted as self study topics*

- Assignment, Seminar

Books for Study-

- Anita Tull, (1987) 1st edition, Food and nutrition – Oxford University press, Cambridge
- Srilakshmi, B, (2012) 5th edition, Food Science, New age International Publishers, New Delhi

Books for Reference:

- Swaraj Pasran Pasricvha, (2000) 1st edition, Count what you eat – NIN – Hyderabad
- Tripathy, S. N (2004) 1st edition, Food Biotechnology, Dominant Publishes and distributors, New Delhi 110002
- Srilakshmi, B, (2012) 6th edition, Dietetics, New age International Publishers, New Delhi

Mapping

CO	PS0	PS01	PS02	PS03	PS04	PS05
	C01	S	H	H	M	S
	C02	S	M	S	M	S
	C03	H	H	H	H	H
	C04	M	S	M	H	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Somasundaram	Dr. M. Durairaju	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	19 UZY 507	Title	Batch :	2019-2022
		Developmental Biology	Semester	V
Hrs/Week:	5		Credits:	4

Course Objective

- To understand the basic concepts and definitions of modern developmental biology.
- Identify and define the landmark events and advances in developmental biology.
- To know about the **applications and recent advances in developmental biology**.

Course Outcomes (CO)

K1	CO1	To remember the steps and advancements in the developmental biology
K2	CO2	To comprehend embryonic formation and developmental stages with suitable example
K3	CO3	To apply functional knowledge on developmental biology into the frontier sciences
K4	CO4	To sort of embryonic development and its functional applications.

Unit	Content	Hrs
Unit-I	- Definition-Ontogeny - Phylogeny Programme of Developmental Biology Theories Pre formation Spemann's experiments on Organizer Gametogenesis Spermatogenesis Oogenesis Fertilization Mechanism <i>In Vitro Fertilization (IVF)</i> Parthenogenesis- Natural and Artificial Significance of Parthenogenesis.	13Hrs
Unit-II	Cleavage Planes (Meridional, Vertical , Equatorial and Latitudinal) Patterns of cleavage (Holoblastic and Meroblastic) Example: Cleavage in frog Gastrulation Types of morphogenetic movements (Epiboly& Emboly). - Exo gastrulation Fate map - Mechanism of morphogenetic movements Example: Gastrulation in frog Cell lineage	13Hrs
Unit-III	Organogenesis in Frog -Ectodermal (Brain) -Mesodermal (Heart) -Endodermal (Alimentary canal) Development of Chick comparison of the cleavage and gastrulation in frog and chick → development of chick based on hour of incubation - Development and significance of fetal membranes in chick.	13Hrs

Unit- IV	Placentation in mammals Classification based on -Fetal membranes -Distribution of villi -Histology-Functions of placenta Neoteny types-factors affecting neoteny- Evolutionary significance Organizer structure-properties- types of induction- embryonic induction-mechanism of induction Nuclear transplantation types- techniques Metamorphosis Aspects of metamorphosis in insects and amphibians, events and hormonal control. Regeneration Types of regeneration – amphibian limb regeneration – stimulus and suppression of regeneration.	13Hrs
Unit -V	Stem cells: embryonic & adult <i>Embryonic stem cell culture and applications.</i> Multiples ovulation and embryo transfer technology (MOET) Embryonic sexing, cloning, screening for genetic disorder diagnosis (ICSI, GIFT etc.) <i>Cloning of animals by nuclear transfer</i>	13Hrs
Total Contact Hrs		65

- Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Discussion, Activity

Books for Study:

- Arumugam .N. (2018) Developmental Zoology - Saras Publication, 114/35G, A.R.P Camp Road, Periyavilal, Kottar Post, Nagercoil - 629002, Tamilnadu, India, 2011
- Veer Bal Rastogi 2017. Chordate embryology Kedar nath ram nath, 132. R.G. College road, Meerut-250 001

Books for Reference:

- Berrill, W. J. and Graw M. C. (2010) Developmental biology - Hill Book Co, New York.
- Wesley, (1979) An Outline of animal development – Davenport, Addison –publishers, University of Michigan.
- Balinsky, 5th Edition, Embryology - Philadelphia, Saunders College Publishing.
- Verma P.S & Agarwal V K (2012) Chordate embryology-S Chand & Company Ltd

Mapping

CO \ PSO	PS01	PS02	PS03	PS04	PS05
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Somasundaram	Dr.M.Durairaju	Dr.M.Durairaju	Dr. R.Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme-code:	B. Sc.	Programme Title :	Zoology
Course Code:	19MZV502	Title:	Batch : 2019-2022
		Biotechnology	Semester V
Hrs/Week:	5		Credits: 4

Course Objective

- To study the basics and applied aspects of biotechnology
- To understand the different application of biotechnology.

Course Outcomes (CO)

K1	CO1	To keep in mind about the basic technologies applied in Biotechnology
K2	CO2	To understand the different blotting techniques, PCR and DNA Fingerprinting
K3	CO3	To apply the cell culture techniques and Patenting, Biotechnology inventions
K4	CO4	To analyze the application of biotechnology and make interest in Biosafety Measures

Unit	Content	Hrs
Unit I	- Introduction- scope and importance of biotechnology - Plasmids pBR 322 - Cosmids - Transposons - Gene map of λ DNA - Construction of recombinant DNA	13Hrs
Unit II	Blotting Techniques: - Southern Blotting - Northern Blotting - Western Blotting - Polymerase Chain Reaction (PCR) - Applications of PCR in Biotechnology - DNA Finger printing - Genomic library	13Hrs
Unit III	- Establish cell lines - Kinetics of cell growth - Hybridoma technology - Monoclonal antibodies - Transgenic animals - Mice - Retroviral method - Microinjection method - Embryonic stem cell method - Applications of transgenic animals	13Hrs
Unit IV	- Animal tissue culture - Explants - Culture media - Culture of animal tissues - Animal bioreactors - Selection and modification of micro-organisms - Preparation of animal - Product harvest - Application of animal bio-reactors - Nano-biotechnology	13Hrs
Unit V	Bacillus thuringensis as a pesticide	13Hrs

	• Biofertilizer • Biosensors- Biochips • Biodegradable plastics • Biosafety - o Possible dangers of GED? - o Implementation of biosafety guidelines • Bioethics - o Monitoring the welfare of transgenic animals - o Keeping of transgenic animals - o Patenting Biotechnological inventions	
Total Contact Hrs		65

- *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment,

Books for Study:

1. Sathyanarayana D (2017) Biotechnology Twelfth Edition
2. Kumarasan V, and Arumugam N (2017) Animal Biotechnology –Saras publications, 114/356, A.R.P Camp Road, Peraiavilai, Kottar Post, Nagercoil - 629002, Tamilnadu, India
3. Gupta, P.K. (2004) Elements of biotechnology - Rastogi publications, Meerut

Books for Reference:

1. Ignacimuthu, S. (1995), Basic Biotechnology, Tata McGraw Hill Publishing Company Ltd, New Delhi
2. Duhey, R.C. (1996) A text book of Biotechnology, Cambridge University Press
3. Molecular Biology and Biotechnology (1993) S.Chand & Company Ltd, New Delhi
4. John, F.Smith, (1993) Biotechnology, Vikas Publishing House Pvt. Ltd, New Delhi
5. Balasubramanian, D. C.F. A. Bryce, Dharmalingam, K. J. Green, Kanthala Jayaraman (2005) Concepts in Biotechnology, University Press (India) Pvt. Ltd, Hyderabad
6. Jayanti Achrekar (2007) Fermentation biotechnology, Dominant Publishers, New Delhi
7. Sayyid and Patel (2009) Biotechnology-emerging trends Scientific publishers India
8. Kumarasan V. (2014) Biotechnology –Saras publications, 114/356, A.R.P Camp Road, Peraiavilai, Kottar Post, Nagercoil - 629002, Tamilnadu, India

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	H	H

S-Strong, H-High, M-Medium, L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by CDE
Dr. S Christobher	Dr. M. Durairaju	Dr.M.Durairaju	Dr.R.Muthukumar
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc	Programme Title :	Zoology
Course Code:	17021501	Title	Batch : 2019-2022
		Biostatistics and Biophysics	Semester V
Hrs/Week:	5		Credits: 4

Course Objective

- The basic knowledge about Biostatistics and Biophysics.

Course Outcomes (CO)

K1	CO1	To recollect the concepts of biostatistics and biophysics.
K2	CO2	To understand the formula and principles used in biology.
K3	CO3	To apply different data used in biological samples.
K4	CO4	To analyze the importance about instruments in biological laboratory.

Unit	Content	Hrs
Unit I	• Collection of data ➤ Methods of collection – Random and Non-random sampling ➤ Primary and Secondary data • Tabulation ➤ Parts of table ➤ Simple and complex table • Diagrammatic presentation ➤ Line diagram ➤ Bar diagram ➤ Pie diagram • Measures of central tendency ➤ Arithmetic mean ➤ Individual - Discrete and Continuous series ➤ Median ➤ Mode	13Hrs
Unit II	• Standard deviation ➤ Individual - Discrete and Continuous series ➤ Merits and demerits • Correlation ➤ Karl Pearson's coefficient of correlation ➤ Positive and negative correlation • Regression analysis ➤ Types and methods	13Hrs
Unit III	• Chi-square Test ➤ Degrees of freedom ➤ Null hypothesis • Student's T-test – Properties and Applications • Analysis of Variance (ANOVA) – One-way analysis	13Hrs
Unit IV	• Scope of biophysics • Thermodynamics principles ➤ First and second law • Bioluminescence ➤ Types ➤ Mechanisms ➤ Functions	13Hrs
Unit V	• Instrumentation ➤ Compound microscope ➤ Electron microscope – Transmission Electron Microscope (TEM) and Scanning Electron Microscope	13Hrs

	(SEM) ➤ Chromatography - Thin layer chromatography (TLC) ➤ Electrophoresis - Polyacrylamide Gel Electrophoresis (PAGE)	
Total Contact Hrs		65

- *Italics denoted as self study topic*

Assignment, PPT, Seminar

Books for Study:

1. Arumugam N. (2017), Basic concepts of Biostatistics - Saras publication 114/35 G, A.R.P Camp Road, Periyavillal, Kottar PO, Nagercoil -629 002, Kanyakumari
2. Arumugam N. and Kumaresan V. (2016) Biophysics and Bioinstrumentation - Saras publication, 114/35 G. A.R.P Camp Road, Periyavillal, Kottar PO, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Veer Bala Rastogi, (2009) 2nd edition. Fundamentals of biostatistics. Ane Books, Pvt. Ltd. New Delhi.
2. Rana, S. V. S. (2009) 2nd edition. Biotechniques - Theory and Practice. Rastogi Publication, Meerut.
3. P. K. Srivastava, (2005) 1st edition. Elementary Biophysics - Narosa Publishing House, New Delhi, 110 002.
4. Subramanian, M. A. (2005) 1st edition, Biophysics - Principles and Techniques - MJP Publishers, Chennai, 600 005.

Mapping

CO	PS0	PS01	PS02	PS03	PS04	PS05
	CO1	S	M	S	H	S
	CO2	H	M	H	H	M
	CO3	M	S	M	M	M
	CO4	M	H	M	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature Dr. M. Durairaju	Verified by HOD Name and Signature Dr. M. Durairaju	Checked by CDC Dr. M. Durairaju	Approved by COE Dr. R. Muthukumarani
Signature	Signature	Signature	Signature

Programme code:	B.Sc	Programme Title :	Zoology	
Course Code:	1902Y510	Title	Batch :	2019-2022
		Medical Laboratory Techniques (Core Elective - I)	Semester	V
Hrs/Week:	4		Credits:	5

Course Objectives

- To understand the basic principles and applications of MLT.

Course Outcomes (CO)

K1	CO1	To remember the structure and function of medical laboratory instruments
K2	CO2	To understand the methods used in medical laboratory
K3	CO3	To apply knowledge about laboratory diagnosis
K4	CO4	To analyze and estimation of blood, urine, faeces, sputum and semen

Unit	Content	Hrs
Unit I	• Introduction & instruments □ Code of conduct for laboratory personnel ◇ Structure of a laboratory • Laboratory instruments ◇ Centrifuge ◇ Autoclave ◇ ECG ◇ B. P. apparatus and stethoscope ◇ Automatic analyzer- Blood ◇ General procedure - cleaning -Sterilization and disposal of infected materials ◇ Safety measures and first aid	13Hrs
Unit II	• Haematology ◇ Blood collection ◇ Anticoagulant - Ammonium & Potassium oxalate mixture ◇ Bleeding time and clotting time ◇ Staining of blood films ◇ Estimation of haemoglobin ◇ Blood cell total count - RBC and WBC ◇ Erythrocyte Sedimentation Rate (ESR) ◇ Glucose Tolerance Test (GTT) ◇ Blood glucose ◇ Anaemia-Iron deficiency anaemia	13Hrs
Unit III	• Urine Analysis ◇ Collection & preservation of urine ◇ Physical examination ◇ Chemical examination ◇ Microscopic analysis • Faeces Analysis ◇ Collection & preservation ◇ Physical examination ◇ Microscopic examination	13Hrs
Unit IV	• Sputum Analysis ◇ Collection & preservation ◇ Naked eye inspection ◇ Microscopic examination ◇ Chemical examination	13Hrs

	• Semen Analysis ○ Collection of semen ○ Physical examination ○ Microscopic analysis ○ Preparation of smear and staining	
Unit V	• Pregnancy test ○ Immunologic methods ○ Pregnancy card. • Sexual Diseases ○ Syphilis ○ Venereal Disease • Clonal Bank ○ Ova Bank ○ Semen Bank ○ Gene Bank	13Hrs
Total Contact Hrs		65

- *Italics denoted as self study topics*

- | |
|---|
| <ul style="list-style-type: none"> • Assignment, Seminar, Power point presentation |
|---|

Books for Study:

1. Samuel, K. M. (1982) Notes on Clinical Lab Techniques. K. Gopalan publishers, Madras
2. Ramnik Sood, M.T. (1999) 5th edition. Jaypee Brothers Medical publishers (P) Ltd. Delhi

Books for Reference:

1. Sachdev, K. N. (1991) Clinical pathology and bacteriology. Jaypee brothers- medical publishers, New Delhi
2. John Macleod and John Munro, (1988) Clinical Examination. ELBS publishers
3. Dutta, A. (2009) Experimental Biology A laboratory manual. Narosa Publishing House, New Delhi.

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	S	H	H	H	S
	CO2	H	H	S	S	H
	CO3	H	S	S	H	H
	CO4	S	H	H	H	S

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature Ms. S. Jayalakshmi Signature:	Verified by HOD Name and Signature Dr. M. Durairaju Signature:	Checked by CDC Dr. M. Durairaju Signature:	Approved by COE Dr. R. Muthukumar Signature:
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Programme code:	B. Sc.	Programme Title :	Zoology	
Course Code:	19UZY511	Title	Batch :	2019-2022
		Bioinformatics and Biochemistry (Core Elective -II)	Semester	V
Hrs/Week:	3		Credits:	3

Course Objective

- To study the basic bioinformatics tools and its uses
- To know the recent development of information and network security

Course Outcomes (CO)

K1	CO1	To keep in mind the basic bioinformatics tools and its uses.
K2	CO2	To comprehend the genomic study, phylogenetic analysis and sequence analysis
K3	CO3	To deploy the information and network security mindset.
K4	CO4	To interpret the common threats today in computer network.

Unit	Content	Hrs
Unit I	- Scope of Bioinformatics - Databases ➤ Biological database (Properties and classification) ➤ Specialized database - Protein sequence database - SWISS-PROT - Data mining - Virtual Library	(7Hrs)
Unit II	- Genomics - Definition, classification and applications - Proteomics - Definition, classification and applications - Drug designing - Human genome project ➤ Goals and techniques ➤ Potential benefits <i>Bioinformatics tools and its uses</i>	(8Hrs)
Unit III	- Similarity tool : BLAST - Visualizing tool : RasMol - Miscellaneous tool : Webcutter - Phylogenetic analysis - Definition and applications <i>Construction of phylogenetic tree - structure of rooted tree</i>	(8Hrs)
Unit IV	Information security Components of Communications System - Transmission Media - Protocol definition - Introduction to TCP/IP - wireless Network - <i>Basics of Internet</i> - Types of attack - Phishing, Spoofing, Impersonation, Dumpster diving - Information Security goals - Information Security Threats and Vulnerability: Spoofing Identity, Tampering with data, Reputation, Information disclosure, Denial of service, Elevation of Privilege.	(8Hrs)
Unit V	Authentication - Password Management - E-Commerce security - Windows Security - Network Security: Network Intrusion detection and prevention systems - Firewalls - Software Security - Web security: User authentication, authentication-secret and session management, Cross site scripting, Cross-site forgery, SQL Injection, Computer Forensics - Steganography	(8Hrs)
Total Contact Hrs		39

- *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Case study

Books for Study:

1. Ron Mansfield, (2009) Working in Microsoft office- McGraw-Hill Book Co, New York
2. Sundaralingam R.& Kumarasan V. (2012) 2nd edition Bioinformatics, Saras Publication, 114/35G, A.R.P Camp road, Periyavillai, Kottar PO, Nagercoil, Kanyakumari.

Books for Reference:

1. Rajaraman, V. (1986) Fundamentals of computer –Prentice Hall of India Pvt.Ltd, New Delhi - 110001
2. Simminder Kaur Thukral, (2007) Bioinformatics-Orpita Bosu, Oxford University Press, New Delhi 110001
3. Attwood T.K.and Parrysmith D.J. (1999) Introduction to Bioinformatics – Addison Wesley Longman, Harlow.
4. Fielker, M.H. (2009) Bioinformatics – Applications in Life and Environmental Sciences Capital Publishing Company, New Delhi.
5. Ignacimuthu, S. (2005) Basic Bioinformatics –Narosa Publishing House, New Delhi.
6. Sharma, Munjal & Shankar (2008) A text book of Bioinformatics -, Rastogi Publications, Meerut, India.
7. Jin Xiong, (2006) Essential Bioinformatics Cambridge University Press
8. Subramanian C. (2010) Genomic Bioinformatics- Dominant Publisher, New Delhi

Mapping

CD \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	H
CO2	H	M	H	H	H
CO3	M	H	H	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Marisely	Dr. M. Durairaj	Dr.M.Durairaju	Dr.R.Muthukumar
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc.	Programme Title :	Zoology	
Course Code:	19UZY617	Title	Batch :	2019-2022
		MAJOR PRACTICAL-III (Developmental biology & Endocrinology, Biostatistics & Biophysics, Animal Physiology & Biochemistry and Medical Laboratory Technique)	Semester	V & VI
Hrs/Week:	2		Credits:	4

Course Objectives

- To study the practical knowledge about the Developmental Biology & Endocrinology, Biostatistics & Biophysics, Biochemistry & Animal Physiology & MLT

Course Outcomes (CO)(for Practicals Only)

K3	CO1	To recollect the importance of laboratory test
K4	CO2	To understand the normal level of human samples
K5	CO3	To apply the instruments used in biological experiment.

Content

EXPERIMENTS

- Qualitative detection of Excretory products
- Total count of RBC
- Total count of WBC
- Estimation of haemoglobin
- Preparation of Blood smear
- Bleeding and clotting time
- Preparation of haemin crystals
- Find the mean and Standard deviation of the given samples

SPOTTERS

Developmental Biology & Endocrinology (structure/developments)

- Frog- Egg
- Frog- Cleavage
- Frog- Yolk plug
- Chick- Egg
- Chick embryo - 24 hours
- Chick embryo - 72 hours
- Chick embryo - 96 hours
- T. S. of Thyroid gland
- T. S. of Ovary
- T. S. of Testis

Biochemistry & Animal physiology (structure and function)

- Structure of haemoglobin
- Structure of pentose
- Structure of sucrose
- Structure of starch
- Structure of cholesterol
- Mammalian Ear
- Mammalian Heart
- Mammalian Kidney

Biostatistics and Biophysics (statistical importance)	
• Multiple bar diagram • Pie diagram • Frequency polygon • Compound microscope • Electron microscope (TEM) • Thin Layer Chromatography (TLC) • Electrophoresis – PAGE • pH meter	
Medical Laboratory Technique (MLT) – (structure, principle and uses)	
• Hemocytometer • Sahli's hemometer • Albuminometer • BP apparatus • Urinometer • Ultra Centrifuge • Autoclave • UV Spectrophotometer	
Total Contact Hrs	52

Books for Reference:

1. Arumugam .N. (2017) Developmental Zoology - Saras Publication, 114/35G, A.R.P Camp Road, Perlavilai, Kottar Post, Nagercoil - 629002 , Tamilnadu, India, 2011
2. H. R. Singh and Neerajkumar, 2014. Animal Physiology and biochemistry, Vishal Publishing Co. Jalandhar, Delhi
3. Ramnik Sood, Medical Laboratory Techniques (MLT). (1999) 5th edn. Jaypee Brothers Medical publishers (P) Ltd. Delhi
4. Mariakuttikan , A. and Arumugam, N. 2014. Animal Physiology . Saras publication. Nagercoil. Kanyakumari Dist. Tamil Nadu

Mapping

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
C01	H	S	H	S	H
C02	M	H	M	H	M
C03	S	H	H	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. M. Durairaju	Dr. M. Durairaju	Dr. M. Durairaju	Dr. R. Muthukumarani
Signature:	Signature:	Signature:	Signature:

Programme codes:	B. Sc	Programme Title :	Zoology	
Course Code:	19UZY618	Title	Batch :	2019-2022
		MAJOR ZOOLOGY PRACTICAL – IV (Ecology, Evolution, Biotechnology, Microbiology Sericulture and Aquaculture)	Semester	V & VI
Hrs/Week:	2		Credits:	4

Course Objective

- To obtain practical knowledge in ecology, evolution, biotechnology, microbiology, sericulture, aquaculture
- To study the physico-chemical nature of environment

Course Outcomes (CO)

K3	CO1	To recollect the knowledge on Ecology, Evolution, Biotechnology, Microbiology, Sericulture and Aquaculture
K4	CO2	To understand the estimation of different water quality parameters, microbial culture and morphometric measurement of fish.
K5	CO3	To access the micro environment and report preparation.

Content

EXPERIMENTS

- Estimation of dissolved oxygen in water samples
- Estimation of carbon dioxide
- Determination of primary productivity
- Estimation of salinity in water samples
- Determination of pH in water samples
- Culture medium preparation (Demonstration only)
- Milk Methylene Blue Test
- Hanging drop preparation
- Morphology and morphometric measurements of fish by using mailer
- Water quality analyzer (Demonstration only)

SPOTTERS

Ecology and Evolution

- Sacculina on Crab
- Albunea
- Hippa
- Anguilla
- Coccyx
- Fossil
- Peppered moth
- Vermiform appendix

Biotechnology/ Microbiology

- E-Coli
- Plasmids
- Biodiesel Plant – Jatropha
- PCR
- Micropipette
- Magnetic stirrer

- Laminar Air Flow
 - Gel Electrophoresis
- Sericulture**
- Silkworm
 - Cocoon
 - Mulberry shoot
 - Mulberry leaf
 - Netti/ka/chandi/ka
 - Leaf Mosaic disease
 - Leaf Blight disease
- Aquaculture**
- Common Carp
 - Gill net
 - Hook
 - Fish parasite- Argulus
 - Chinese dip net
 - Edible Oyster
 - Pearl oyster - *Pinctada vulgaris*

Total Contact Hrs 52

Mark Distribution:

Total Marks	Internal(CIA)	Marks	End of semester Practical Examination (ESE)	Marks
100	Practical	10	Experiments	20
	Skill/observation		Spotters	20
	Model Practical Examination	20	Field visit /Micro-environmental study/ report preparation	10
	Record work	10	Record	10
	Total Marks	40	Total Marks	60

Hands on experience in practicals, Activity.

Books for Reference:

1. Ganga, G and Sulochana chetty,(1999). An introduction to sericulture. Oxford and IBH Publishing company Pvt. Ltd. New Delhi
2. Jayasurya, (2016). Economic Zoology. Saras publication. Nagarcoil, Kanyakumari Dist. Tamil Nadu
3. Kumaresan, V (2016) Biotechnology. Saras publication. Nagarcoil, Kanyakumari Dist. Tamil Nadu
4. Odum, E. P (1971) Fundamentals of ecology W.B. Sanders Company, London
5. Arumugam, N. (2016) Aquaculture SABAS Publications, Nagercoil, Tamilnadu.
6. ICAR Publication (2006) 1st edition: Hand book of fisheries and aquaculture, Directorate of information and publications of agriculture. Indian Council of Agricultural Research, New Delhi

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	M	H	H	H
CO3	M	S	H	M	M

Course Designed by

Verified by HOD

Checked by

Approved by

Name and Signature	Name and Signature	CDC	COE
Dr. S. Somasundaram	Dr. M. Durairaju	Dr.M.Durairaju	Dr.R.Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	19UZYG12	Title	Batch : 2019-2022
		Animal Physiology and Endocrinology	Semester VI
Hrs/Week:	5	Credits:	5

Course Objective

- The complex understanding of all the chemical process associated with living cell
- To study the basis for various organ systems in the animal kingdom

Course Outcomes (CO)

K1	CO1	To remember the bio chemical and physiological structure and activity of individual cell level
K2	CO2	To comprehend physiological activity of organ system and bio chemical activity of cells
K3	CO3	To apply functional knowledge on various organs, endocrine glands and its status
K4	CO4	To sort of animal is physiology and endocrinology

Unit	Content	Hrs
Unit- I	• Digestion Functional analysis of digestive system Digestion and absorption Neuronal/hormonal regulation of gastric-intestinal movements and secretions. • Respiration: Aerobic & Anaerobic respiration Respiratory pigments in animals Transport of gases - O_2 and CO_2 • Circulation: Myogenic & Neurogenic heart Pacemaker and electrical activity of heart in man Composition and functions of blood Composition and functions of Lymph	13Hrs
Unit- II	• Water Balance: Osmotic and ionic regulations in aquatic animal (Fish) • Receptors: Chemoreceptors- Gustator receptors & Olfactory receptors Photoreceptor (Eye) Phonoreceptor (Hear) • Effectors: ➤ Types of muscles : Striped- unstriped and cardiac muscles ➤ Structure and properties of striped muscle ➤ Mechanism of muscular contraction- sliding filament theory.	13Hrs
Unit- III	• Nervous system: ➤ Structure of vertebrate neuron ➤ Conduction of nerve impulse through: Non-myelinated neuron Synapse ➤ Neuromuscular junction	13Hrs

	➤ Reflex action and reflex arc • Excretion: Structure of mammalian kidney Structure of Nephron Synthesis of ammonia : urea and uric acid Formation of urine in Human • Reproductive system: Male and female reproductive system structure -Sexual cycle in human: Puberty - Spermiation - Ovulation - Menstrual cycle - Pregnancy and Parturition.	
Unit- IV	• Endocrinology-Definition • Endocrine glands (Structure & Functions) Pituitary Thyroid Parathyroid Pancreas Testes & ovary • Hormonal interactions- Feedback control mechanism-	13Hrs
Unit- V	• Mechanism of hormone action; peptide, steroid & thyroid. • Hormonal disorders Pancreas (Diabetes mellitus) Thyroid (Goitre) Pituitary (Gigantism - Dwarfism) Sex hormones (Fertility)	13Hrs
Total Contact Hrs		65

• *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Discussion, Activity, Case study

Books for Study:

1. Arumugam N. (2017) Animal physiology- Saras Publication, 114/35G, A.R.P Camp Road, Periyavilai, Kottar Post, Nagercoil - 629002, Tamil nadu, India
2. Rastogi S.G. (2008) Essentials of Animal Physiology, 4th Edition - New age international publishers

Books for Reference:

1. Parameswaran, Ananthakrishnan & Ananthasubramaniam, (1991) Outline of animal physiology - S. Viswanathan printers & Publishers Pvt. Ltd,
2. Verma, P. S., Tyagi and Agarwal. (1997) Animal physiology - Chand & company Ltd.
3. S. Sree Kumar, (2010) Basic Physiology - PHI Learning Pvt. Ltd, New Delhi, 110001, Edition.
4. Berry, A.K. A text book of Animal Physiology - EMKAY Publication, New Delhi-110051
5. Sreenkumar S., (2010) Edition. Basic Physiology - PHI Learning Pvt. Ltd, New Delhi.
6. Sastri, K.V. (2009-2010) Endocrinology & Reproductive Biology -Rastogi Publications, Shivaji road, Meerut-250002, India.
7. Prakash S. Lohar, (2005) Endocrinology. MJP Publishers, Chennai.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Somasundaram Signature:	Dr. M. Durairaju Signature:	Dr.M.Durairaju Signature:	Dr.R.Muthukumaran Signature:

Programme code:	B.Sc	Programme Title :	Zoology	
Course Code:	1912Y613	Title	Batch :	2019-2022
		Ecology and Evolution	Semester	VI
Hrs/Week:	5		Credits:	4

Course Objective

- Knowledge about the basic concepts of Ecology and Evolution.

Course Outcomes (CO)

K1	CO1	To recollect the importance of abiotic factors and origin of life
K2	CO2	To understand the basic concepts of animal relationship and fossils
K3	CO3	To apply knowledge about animal ethics and evidences of evolution
K4	CO4	To analyse the animal population and organic evolution of man

Unit	Content	Hrs
Unit I	• Scope of ecology • Abiotic factors ➤ Soil: Pedogenesis - Soil texture- Soil profile – Soil fauna. ➤ Water: Properties of water ➤ Temperature: Range of temperature- Thermal stratification- biological effects of temperature ➤ Light: light on water – biological effects of light	(13Hrs)
Unit II	• Biogeochemical cycle ➤ Gaseous cycle - Carbon cycle- Nitrogen cycle ➤ Sedimentary cycle: Sulphur cycle-Phosphorus cycle • Animal relationship ➤ Commensalism ➤ Mutualism ➤ Parasitism • Animal population ➤ Characteristics of population - Natality- mortality- growth- density • Animal Ethics ➤ Animal rights ➤ Animal law ➤ Wild life conservation.	(13Hrs)
Unit III	• Biochemical origin of life • <i>Orey and Miller's experiment</i> • Geological time scale • Fossils: Types and Dating of fossils	(13Hrs)
Unit IV	• Evidences of evolution ➤ Morphological: Homologous structures – vestigial organs – connecting links ➤ Embryological: Recapitulation theory ➤ Palaeontological: Missing links	(13Hrs)
Unit V	• Darwinism : Over production – variation – survival of the fittest – struggle for existence – origin of species • Isolating mechanism ➤ Geographic isolation ➤ Reproductive isolation • Organic evolution of man	(13Hrs)
Total Contact Hrs		65

- *Italics denoted as self study topics*

Assignment ,Seminar, PPT, Case study

Books for Study:

1. Arumugam N. (2017) Concepts of ecology. Saras publication 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PO, Nagercoil -629 002, Kanyakumari
2. Arumugam N. (2015) Organic Evolution -- Saras publication 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Odum E. P. (1971) 1st edition. Fundamentals of ecology , W. B. Saunders Company, London.
2. Verma and Agarwal. (2003) 5th edition. Principles of Ecology. S. Chand & Company, Ltd. New Delhi, 110055
3. Tomar and Singh, (2010) 8th edition. Evolutionary Biology - Rastogi Publication. Meerut. 250 002
4. Saha, T. K. (2002) 1st edition. Life: Origin, evolution and adaptation. Books and allied (P) Ltd. Kolkata - 700 010

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	S	H	M	M	S
	CO2	H	S	H	M	H
	CO3	H	M	M	H	M
	CO4	M	M	H	M	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature Dr. M. Durairaju	Verified by HOD Name and Signature Dr. M. Durairaju	Checked by CDC Dr. M. Durairaju	Approved by COE Dr. R. Muthukumarani
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc	Programme Title :	Zoology
Course Code:	19H2Y614	Title	Batch : 2019-2023
		Microbiology and Immunology	Semester VI
Hrs/Week:	5		Credits: 4

Course Objectives

- To acquire a basic knowledge of microbiology and immunology

Course Outcomes (CO)

K1	CO1	To keep in mind the scope of microbiology and immunology
K2	CO2	To understand the classification of microorganisms and immunity
K3	CO3	To apply the knowledge about food microbiology, Agricultural microbiology, Medical microbiology
K4	CO4	To analyse disease producing microorganism

Unit	Content	Hrs
Unit I	• Introduction and scope of microbiology • Classification of microorganisms • Basic methods in Microbiology ◊ Pure culture : Isolation and purification techniques ◊ Types of culture media ◊ Preparation of Culture media ◊ Culture techniques of microorganisms • Staining procedure and types of staining ◊ Simple staining ◊ Negative staining ◊ Gram staining ◊ Acid-fast staining	13Hrs
Unit II	• Bacteria: ◊ Major features and structure of bacteria ◊ Economic importance of bacteria ◊ Bacterial growth and Growth curve ◊ Bacterial culture – Culture of <i>E.Coli</i> • Viruses: ◊ Characteristic and structure of viruses ◊ classification of virus ◊ Bacteriophages – life cycle – lytic – lysogenic	13Hrs
Unit III	• Applied microbiology ◊ Agricultural microbiology: • Role of microorganism in soil fertility • Biofertilizers • Harmful role of microorganism ◊ Food microbiology: • Microorganisms of food • Factors influence microbial growth • Food spoilage- Food preservation	13Hrs

	○ Medical microbiology ▪ Normal microflora of human body ▪ Bacterial Diseases - Botulism, Cholera ▪ Viral Diseases - Measles, Viral hepatitis	
Unit IV	▪ Immunology ○ Introduction and scope of Immunology ▪ Classification of Immunity - Innate and Acquired Immunity ▪ Immune Response ○ Mechanism of Humoral immune response ○ Mechanism of Cell mediated immune response ▪ Lymphoid Organs ○ Primary lymphoid organs ○ Secondary lymphoid organs ▪ Cells of the immune system ○ Lymphoid lineage ○ Myeloid lineage	13Hrs
Unit V	▪ Immunoglobulins ○ Structure of immunoglobulin ○ Classes and properties of immunoglobulin ▪ Classification of Major Histocompatibility Complex (MHC) ▪ Tumor immunology ○ Properties of tumor cells ○ Immune diagnosis and immunotherapy of tumor	13Hrs
Total contact Hrs		65

- *Italics denoted as self study topics*

Assignment, Seminar, Power point

Books for Study:

1. Mani, A., Selvaraj, A.M., Narayanan, I. M. and Arumugam, N. (2007) Microbiology. Saras publications, 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PO, Nagercoil -629 002, Kanyakumari
2. Dulcy Fatima and N, Arumugam. Immunology, (2013) Saras Publications, 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Dubey R. C. and Maheswari, D.K. (2013) A Text book of Microbiology, Cambridge University Press
2. Ignacimuthu, S. (1995) Basic Biotechnology –Tata McGraw Hill Publishing Company Ltd, New Delhi.
3. Dubey, R. C. (1996) A text book of Biotechnology –Cambridge University Press
4. John.E.Smith, (1993) Biotechnology –, Vikas Publishing House Pvt. Ltd, New Delhi
5. Gupta. P. K. (2004) Elements of biotechnology –Rastogi Publications, Meerut
6. Shyamasree ghosh, (2017) Immunology and Immunotechnology –Books and allied (P) Ltd.

Mapping

CO	PSO	PS01	PS02	PS03	PS04	PS05
	CO1	S	S	H	H	S
	CO2	H	H	S	S	H
	CO3	S	S	S	H	S
	CO4	H	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature Ms. S. Jayalakshmi	Verified by HOD Name and Signature Dr. M. Durairaju	Checked by CDC Dr. M. Durairaju	Approved by COE Dr. R. Muthukumar
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc	Programme Title :	Zoology	
Course Code:	19UZY615	Title	Batch :	2019-2022
		Sericulture	Semester	VI
Hrs/Week:	4		Credits:	3

Course Objective

- ★ To study the culture of mulberry plantation and rearing of silkworm

Course Outcomes (CO)

K1	CO1	To remember the historical background of Sericulture and importance of agricultural production.
K2	CO2	To get the idea for increasing cocoon productivity and to prevent silkworm diseases
K3	CO3	To execute the construction of rearing house and self employment in silkworm rearing
K4	CO4	To analyze this course for employment and job opportunities in the public, private and Govt. sectors.

Syllabus

Unit	Content	Hrs
Unit I	• Definition and History of Sericulture • Economic importance of sericulture • Varieties of silkworms: ○ Mulberry silk worm: <i>Bombyx mori</i> ○ Non- Mulberry silk worm: Tasar- Muga and Eri silk worms • Uses of silk • Central and state silk board - Functions • Moriculture: Optimum conditions for mulberry growth • Planting direction and season • Planting systems	10 Hrs
Unit II	• Methods of vegetative Propagation ○ Cutting ○ Layering ○ Grafting • Pruning: Low cut-High cut and Rejuvenation pruning • Methods of Leaf harvesting • Preservation of leaves • Diseases of Mulberry: Fusarium Root Rot – Powdery Mildew – Leaf Blight – Leaf Mosaic disease	11 Hrs
Unit III	• Life cycle of <i>Bombyx mori</i> • Structure of silk worm • Structure of Silk gland • Graines • Incubation and Brushing • Silkworm rearing appliances	10 Hrs
Unit IV	• Disinfection • Rearing of mature larvae: Shelf- Floor and shoot rearing • Characteristics features of ripeworm • Mounting: Methods and precaution during mounting • Diseases of silk worms: ○ Pebrine ○ Viral Flacherie (IFV) ○ Grasserie Nuclear Polyhedrosis (NPV)	11 Hrs

	Indian Uzi fly (Pest of silk worm)	
Unit V	<i>Physical characteristics of cocoons</i> - Defective cocoons - Reeling appliance - Country Charkha - Cocoon Markets - Raw silk testing	10 Hrs
Total Contact Hrs		52

- Italics denoted as self study topics*

Power point Presentations, Seminar , Assignment

Books for Study:

- Ganga G. and Sulochana Chetty. J. (2008) An Introduction to sericulture – Oxford and IBH Publishing Co. PVT. LTD.

Books for Reference:

- Ullal and Narasimhanna. M.N. 2nd Ed. Hand Book of practical sericulture –SBS Publishers, Bangalore
- Manual on sericulture – FAO, Central Silk Board Bangalore.
- Ezhili N. & Thirumathal K. (2008) A hand book for sericulture – , Shrishti Impression, Coimbatore

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	H
CO2	H	M	H	H	H
CO3	M	H	S	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Mariselvi	Dr. M. Durairaju	Dr.M.Durairaju	R.Muthukomaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc	Programme Title :	Zoology
Course Code:	19UZY616	Title	Batch : 2019-2022
		Aquaculture (Core Elective -III)	Semester VI
Hrs/Week:	5	Credits:	5

Course Objective

- To study the nature and habitat of different aquatic animals

Course Outcomes (CO)

K1	CO1	To keep in mind the environmental assessment strategies and management systems
K2	CO2	To deduce the techniques involved in the culture of various organisms
K3	CO3	To apply the knowledge in food sectors, hatchery and nursery operations
K4	CO4	To sort of the structure and functions of aquatic ecosystems

Unit	Content	Hrs
Unit I	- Scope of aquaculture <i>Aquaculture in India</i> - General character and adaptations in fishes - General Organization of fish ➤ Teleost - <i>Labeo rohita</i> ➤ Morphology and anatomy ▪ Digestive system ▪ Reproductive system ▪ <i>Economic importance of fish, Nutritive value of fish</i> - Pond culture: different kinds of fish ponds in a model fish farm.	12hrs
Unit II	- Culture methods ➤ mono culture ➤ poly culture ➤ integrated culture - Brackish water culture - Fresh water culture - Marine culture - Age and growth study <i>Hypophysation</i> - Fish feed ➤ Classification of feed ➤ Composition of feed ➤ Live feed	10hrs
Unit III	- Bionomics of some important aquatic animals - Fresh water fishes ▪ Indian major carps- Catla, Mrigal, Rohu ▪ Exotic fishes- Common carp, Tilapia. - Marine fish- Oil Sardine - Estuarine fish- Mullet - Prawn culture - Oyster culture - Pearl culture	10hrs

Unit IV	- Fish crafts – different types of fishing boats - Gears ➤ Hooks ➤ Simple dipnets ➤ Chinese dipnets ➤ Gill nets ➤ Purse seine ➤ Trawl nets - Fish processing ➤ Identification of good and spoiled fish ➤ Refrigeration ➤ Freeze drying ➤ Fumigation ➤ Canning ➤ Salting	10hrs
Unit V	- Ornamental fish culture ➤ Requirements and setting of an aquarium ➤ Aquarium fishes - Fish pathology and major diseases ➤ Bacterial diseases - <i>Dropsy, Gill Rot</i> ➤ Viral diseases - <i>Bacterial ulcerative syndrome, Haemorrhagic septicaemia</i> ➤ Fungal diseases - <i>Gill Rot, Saprolegniasis</i> ➤ Fish parasites - <i>Protozoan diseases, Monogenean and metacercarial diseases, Trematodes</i> - Principles of harvesting- transport and marketing - By-products of fishes - Role of fishes in mosquito control - Transgenic fishes	10hrs
Total Contact Hrs		52

- Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Case study

Books for Study:

1. Arumugam, N. (2018) Aquaculture SARAS Publications, Nagarcot, Tamilnadu.
2. Shanmugham, K. (1992) Fishery biology and aquaculture, LEO Pathippagam, Madras.

Books for Reference:

1. Vadapalli and Satyanarayanan, (1996) Fish culture, Narendra publishing house, Delhi.
2. Datta Munshi and Srivastava, (1988) Natural history of fishes and systematic of Fresh-water fishes of India, Narendra Publishing House, New Delhi.
3. Jordan E. L. and Verma: P. S. (2000) Chordate Zoology, S. Chand and company LTD, New Delhi
4. Agarwal, S. C. (1994) A hand book on fish farming, Narendra publishing house, Delhi
5. Pandey and Shukla, (2010) Fish and fisheries, Rastogi publication
6. Charis L. Cotting, (1999) Fish processing and preservation, Agrobotanical publishers (India)
7. ICAR Publication (2006) 1st edition, Hand book of fisheries and aquaculture, Directorate of information and publications of agriculture, Indian Council of Agricultural Research, New Delhi.
8. Jhingran, V.G. 1988. Fish and Fisheries of India – Hindustan Publishing Corporation India Delhi. Printed in India at Gopsons paper Pvt. Ltd, Koida.

Mapping

CO \ PSO	PS01	PS02	PS03	PS04	PS05
C01	H	S	M	H	H
C02	H	M	H	S	H
C03	M	H	S	M	M
C04	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr.S.Christobher	Dr. M. Durairaju	Dr.M.Durairaju	Dr.R.Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	19UZY6S3	Title	Batch :	2019-2022
		Vermiculture (SBE)	Semester	VI
Hrs/Week:	1		Credits:	2

Course Objective

- To study the importance of vermiculture

Course Outcomes (CO)

K1	CO1	To remember the role of worm farming in Modern Farming
K2	CO2	To understand Economic importance of vermiculture
K3	CO3	To deploy Role of Vermiculture in protecting the environment and managing the waste
K4	CO4	To analyze the potential of vermicompost as an alternative to chemical fertilizers

Unit	Content	Hrs
Unit I	Systematic position of Earthworm – Habit and Habitat Commercial varieties of Earthworm for Vermicomposting. <i>Economic importance of vermiculture</i>	(3Hrs)
Unit II	Type study: Earthworm: Megasciolex sp. External character - Digestive system Respiratory system Excretory system Reproductive system	(3Hrs)
Unit III	Life cycle of Earthworm Diseases and Predators of Earthworm Control measures	(2Hrs)
Unit IV	Types of soil Biomass Biodegradable wastes Nutrient content of Soil and Biomass	(2Hrs)
Unit V	Preparation of Vermibed Maintenance of Composting pit Collection of vermicompost Nutrient value of vermicompost <i>Vermiwash</i> Marketing of vermicompost	(3Hrs)
Total Contact Hrs		13

- Italic denoted as self study topics*

Power point Presentations, Seminar, Assignment , Case study

Books for Reference:

- Ekambaranatha Iyer, (1990) A Manual of Zoology, Part I & II, Invertebrata, Revised edition. S. Viswanathan(Printers and Publishers)
- Odum, E. P (1971) Fundamentals of ecology W.B. Sanders Company, London
- Gupta, P. K. (2005) Vermicomposting for sustainable agriculture. Agrobios, Jodhpur, India
- Rana, S. V. S. (2010) Environmental biotechnology. Rastogi Publication, Meerut, India

5. Aravind Kumar. (2005) Verms and vermitechnology APH Publishing co-operation.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	H	H
CO3	M	H	H	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr.P.R.Balasubramanian	Dr. M. Durairaju	Dr.M.Durairaju	Dr.R.Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc	Programme Title :	Zoology	
Course Code:	18UZY6S4	Title	Batch :	2018-2021
		Poultry Science And Management Technology (SBE)	Semester	V
Hrs/Week:	1		Credits:	2

Course Objective

- To know the basic concept of poultry science

Course Outcomes (CO)

K1	CO1	To keep in mind the role of poultry science
K2	CO2	To get the idea on poultry house and management.
K3	CO3	To execute feed formulation for broiler, layer and breeders.
K4	CO4	To evaluate the nutritive value of poultry meat and egg. To analyze the transport and marketing.

Unit	Content	Hrs
Unit I	• Importance and role of the poultry in rural development and employment potential. • Anatomy and physiology of poultry birds (hen) with reference to digestive and reproductive systems.	3Hrs
Unit II	• Poultry house and equipment • Space requirements • Types of houses • <i>Summer management- Winter management</i> • Sterilization of room	3Hrs
Unit III	• Classification of feed stuffs • Availability of raw materials and their cost • Feed formulation and Feeding programme • Equipment for feeding and drinking.	2Hrs
Unit IV	• Management of Broilers • Management of layers • Management of Breeders • Common diseases – Bird flu disease • Antibiotics- Vaccination and deworming • Insecticide treatment and Bio-remedies	3Hrs
Unit V	• <i>Nutritive value of poultry meat and egg</i> • Grading and Preservation of eggs • Packing and Transport and Marketing • Different uses of eggs • Poultry manure.	2Hrs
Total Contact Hrs		13

- *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Case study

Books for Reference:

1. Rice . E.J and Botosford . H. E. Practical poultry management . John Wiley, Hansen Inc. N.Y.
2. Gnanmani, J . Profitable poultry product ; Pyton publ. Co. Madurai, Tamilnadu
3. Siddiqui. H.M Manual of poultry production Practicals : College of Veterinary Science, Andrapradesh.
4. Shukla. Upadhyay (2003). Economic Zoology –Rastogi Publications, Shiyaji Road, Meerut- India

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	M	H	H	H
CO3	M	S	S	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Christobher	Dr. M. Durairaju	Dr.M.Durairaju	Dr.R.Muthukumaran
Signature:	Signature:	Signature:	Signature:

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Programme code:	B.Sc.	Programme Title :	Zoology
Course Code:	11H12YRS3	Title	Batch : 2019-2022
		Biopharmaceuticals (NME)	Semester IV
Hrs/Week:	1	Credits:	2

Course Objectives

- To enable the students to know the actual path of metabolism of drugs and drug discovery.

Course Outcomes (CO)

K1	CO1	To keep in mind the Routes of administration in biological systems and models
K2	CO2	To understand the drug metabolism
K3	CO3	To implement the microbial products in pharmaceutical industry
K4	CO4	To discuss the DNA technology in Pharmaceutical products

Unit	Content	Hrs
Unit I	Biological systems and models: Routes of administration- adsorption enhancement- bioavailability- site specific delivery; Pharmacodynamics of protein therapeutics- Inter species scaling	3hrs
Unit II	Drug metabolism: Oxidation- reduction- hydrolysis- conjugation; Need for developing new drugs; Procedure followed in drug design; Prodrug and soft drugs; Drug toxicity.	3hrs
Unit III	Drug discovery & cardiovascular drugs: Substances derived from bacteria- plants- insects- and animals; Sources of active principles; drugs used in atherosclerosis	3hrs
Unit IV	Pharmaceutical products: Microbial products - Antibiotics (penicillin- streptomycin- tetracycline)- vitamins- probiotics. Animal vaccines- Anti platelets drugs	2hrs
Unit V	Pharmaceutical products of DNA technology: Therapeutic proteins - Insulin- human growth hormone- Diuretics- clotting factors-Vector usage strategies for gene therapy; <i>Clinical trials</i>	2hrs
Total Contact Hrs		13

- *Italics denoted as self study topics*

- Assignment, Seminar

Books for Reference:

1. Heinrich Klefenz, (2002) "Industrial Pharmaceutical Biotechnology". WILEY-VCH Publication, Germany.
2. Daan Crommelin, & Robert D Sindelar, (2002) "Pharmaceutical Biotechnology", Taylor and Francis Publications, New York.
3. Jay P Rho and Stan G Louie, (2003) "Hand book of Pharmaceutical Biotechnology", Pharmaceutical products press, New York.
4. Lachman L Lieberman, HA, and Kanig, J. (1986) "Theory and practice of industrial pharmacy", 3rd edition, Varghese publishing & Co, New Delhi.
5. Remington's Pharmaceutical sciences, (2000) 18th edition, Mack publishing & Co., Easton, PA.

Mapping

CO	PS0	PS01	PS02	PS03	PS04	PS05
C01		S	S	M	H	S
C02		H	M	H	H	H
C03		M	S	S	M	M
C04		M	H	H	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. M. Durairaju	Dr. M. Durairaju	Dr. R. Muthukumar
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	18EVS201	Title	Batch : 2018-2021
		Environmental Studies	Semester II
Hrs/Week:	2		Credits: 2

Course Objective

- To know the basic concepts of Environment

Course Outcomes (CO)

K1	CO1	To create an awareness about the Environment
K2	CO2	To get the idea on Environment conservation and management.
K3	CO3	To execute the pollution free environment in future perspectives.
K4	CO4	To evaluate the value of Natural Resources

Unit	Content	Hrs
Unit I	1. The Multidisciplinary nature of Environmental Studies: - Introduction - Scope of Environmental Studies - Need for Public Awareness 2. Natural Resources - Types of Natural Resources - Natural resources and associated problems - Forest resources - Water resources - Mineral resources - Food resources - Energy resources* - Role of an individual in conservation of natural resources - case studies	5Hrs
Unit II	3. Ecosystems: - Concept of an ecosystem - Structure and function of an ecosystem - Energy flow in the ecosystem - Ecological succession - Structure and functions of a) Aquatic ecosystems b) Terrestrial ecosystems 4. Biodiversity and its conservation: - Introduction - Genetic diversion - Species diversion - Value of Biodiversity - Hot - Spots of Biodiversity - Threats to biodiversity - Endangered and Endemic Species of India - Conservation of biodiversity	5Hrs
Unit III	5. Environmental Pollution: - Causes, effects and control measures of - Air Pollution - Water pollution - Soil pollution - Noise pollution * - Thermal pollution - Radioactive pollution - Pollution case studies	6Hrs

	6. Solid waste management: • Causes, effects and control measures • Role of individual in prevention of pollution	
Unit IV	7. Disaster management: Floods, Earthquake, Cyclone and Landslides 8. Social issues and environment: • Sustainable Development • Urban problems related to energy • <i>Rainwater harvesting *</i> • Environmental Ethics • Global warming	5Hrs
Unit V	9. Environmental Legislations and Acts: a. Environment (Protection) Act b. Air (prevention and control of pollution) Act c. Water (Prevention and control of pollution) Act d. Wildlife protection Act e. Forest conservation Act 10. Human Population and Environment: • Population growth and explosion • Environment and Human health • Value education • Role of Information Technology in Environment and Human health	5Hrs
Total Contact Hrs		13

- *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Case Study

Field work:

- Visit to local area to document environmental assets river / forest / Grassland Mountain
- Visit to a local polluted site— urban / rural / industrial / agricultural

Text Book:

1. N Arumugam, M.Durairaju and V.Kumaresan— (2018 Reprint) – Environmental Studies

Books for Reference:

1. Odum E. P. (1971) 1st edition Fundamentals of ecology, W. B. Saunders Company, London.
2. Verma and Agarwal. (2003) 5th edition. Principles of Ecology S. Chand & Company, Ltd. New Delhi, 110055.
3. Agarwal, K.C. 2001 Environmental Biology, Nadi Publ. Ltd. Bikaner.
4. Bhattacha Eruch, The Biodiversity of India, Mapin Publishing Pvt. Ltd. : Ahmedabad - 13, India. Email: mapin@icenet.net
5. Clark R.S., Marine Pollution, Clarendon Press Oxford (TB).
6. Cunningham, W.P.Cooper, T.H.Gorham, E. & Hepworth, M.T.2001
6. Environmental Encyclopedia, Jaico Publ. House. Mumbai, 1196p

Mapping

CO \ PSO	PS01	PS02	PS03	PS04	PS05
CO1	H	H	M	H	H
CO2	H	M	H	H	H
CO3	M	S	S	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Compiled By

Dr. M.Durairaju M.Sc., M.Phil., B.Ed., PGDGC., Ph.D.,
Associate Professor in Zoology /
Co-ordinator, Curriculum Development Cell (CDC)
NGM College, Pollachi – 642 001

S-Strong; H-High; M-Medium; L-Low

Programme code:	B.Sc.	Programme Title :	Zoology	
Course Code:	1901ZYSS1	Title	Batch :	2019-2022
		Apiculture (SBE)	Semester	V
Hrs/Week:	1		Credits:	2

Course Objective

- To examine the scope of beekeeping in India and other countries.
- To identify major bee keeping challenges and opportunities.
- Purchase of honey, wax and byproducts from bee keeping industry

Course Outcomes (CO)

K1	CO1	To remember the steps involved in modern bee keeping techniques and its practical difficulties.
K2	CO2	To comprehend methodologies involved in bee keeping.
K3	CO3	To apply modern tools in bee keeping and value added product preparation.
K4	CO4	To validate different bee keeping techniques and its byproducts.

Unit	Content	Hrs
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Unit- I	Scope of Apiculture Classification of honey bee Types of honey bee – <i>Apis dorsata</i> – <i>Apis indica</i> – <i>Apis florae</i> – <i>Apis mellifera</i> Biology of honey bee – External Structure of worker bee Life cycle of honey bee	3Hrs
Unit- II	Social organization of honey bee colony – Queen – Drones and Worker Structure of beehive Food of Honeybees Modern bee hive – Langstroth hive – Newton's hive	3Hrs
Unit- III	Bee keeping equipments Extraction of honey Honey – Properties – Chemical composition – Value of honey (Nutritional/Medical values)	2Hrs
Unit- IV	Royal jelly – Composition and functions Bee wax – Production – Characteristics and uses Bee venom – Characteristics and uses	2Hrs
Unit- V	Diseases of honey bee – Bacterial disease – Viral disease – Acarine disease – Queen rearing – Procedure – Hopkins method – Miller method and Franklin method.	3Hrs
Total Contact Hrs		13

* *Italics denoted as self study topics*

Power point Presentations, Seminars, Assignment, Discussions.

Books for Study:

- Arumugam N. (2017) Applied Zoology, Saras Publications, 114/35 G. A.R.P Camp Road, Peravilal, Kotar RD, Nagercoil -629 002, Kanyakumari

Books for Reference:

- Bhambhani Kavita Juneja H.S. (2003) 2nd edition, An Introduction to Arthropoda, Anmol Publications Pvt. Ltd, New Delhi.
- Shukla Upadhyay (2003), Economic Zoology – Hastogi Publications, Siryaf Road, Meerut-250002, India
- Dharm Singh & Sureshwar Prasad Singh, (2006) edition- A handbook of Bee Keeping – Agrobios (India), Jodhpur.
- Hagendra Singh & Sachan G.C. (2010) 1st edition, Elements of Entomology, Hastogi Publications, Meerut.
- Bee keeping basics, MAAREG, Delaware, Maryland, New Jersey, Pennsylvania, West Virginia & the USDA Co-operating PENNSTATE US5- E-book

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Sumasindaram	Dr. M. Durairaju	Dr. M. Durairaju	Dr. R. Muthukumar
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc.	Programme Title ;	Zoology		
Course Code:	1902YSS2	Title	Batch :	2019-2022	
		Insect Pest Management(SHE)	Semester	IV	
Hrs/Week:	1		Credits:	2	

Course Objectives

- To study the insect available in the agricultural field

Course Outcomes (CO)

K1	CO1	To remember agricultural pest and their management
K2	CO2	To understand the control of pest management
K3	CO3	To apply modern methods in agricultural field
K4	CO4	To interpret application of pesticide

Unit	Content	Hrs
Unit I	Pest definition – Definition – Classification Reasons for insect pest Insect pest out break Injuries and Damage caused by insect pest	3Hrs
Unit II	Assessment of insect pest population Assessment of insect pest damage Pest surveillance and forecasting pest outbreak Need for insect pest management	3Hrs
Unit III	Pest control Climatic factors Natural enemies Physical	2Hrs

	Mechanical <i>Cultural - biological and legal control</i>	
Unit IV	Insecticide- Definition- Formulation of insecticides Classification based on modern entry Classification based on modern action Brief account of Attractants- Antifeedants and Chemosterilants <i>Integrated Pest Management</i>	2Hrs
Unit V	(Major Local Agricultural pest and their Management) Cotton - The cotton Boll worm - <i>Helicoverpa armigera</i> Coconut - The Rhinoceros beetle - <i>Oryctes rhinoceros</i> Groundnut - The Red hairy caterpillar - <i>Amsacta ulbistriga</i> Sugarcane - The sugarcane stem borer- <i>Chilo infuscatellus</i>	2Hrs
Total Contact Hrs		13

- *Italics denoted as self study topics*

Assignment, Seminar

Books for Reference:

1. Shukla, Upadhyay (2003). Economic Zoology -, Rastogi Publications, Shivaji Road, Meerut- 250002, India.

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	H	H	H	H	S
	CO2	S	M	H	H	H
	CO3	S	S	S	M	M
	CO4	H	H	H	M	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi Signature:	Dr. M. Durairaju Signature:	Dr. M. Durairaju Signature:	Dr. R. Muthukumaran Signature:

DEPARTMENT OF ZOOLOGY

B.SC. ZOOLOGY SYLLABUS

BATCH: 2018-2021

FACULTY MEMBERS

Dr. P. R. Balasubramanian, M. Sc., M. Phil., M.A., B. Ed., PGDCA., Ph.D (HOD)

Dr. M. Durairaju, M. Sc., M. Phil., B. Ed., PGDGC., Ph.D.

Dr. S. Somasundaram M.Sc., B. Ed., Ph.D., P.G.MBT

Ms. S. Mariselvi, M.Sc., M. Phil., PGDCA., Ph.D

Ms. S. Jayalakshmi, M.Sc., M. Phil., Ph.D



NGM College

An Autonomous Institution Affiliated to Bharathiar University

Accredited with 'A' Grade by NAAC

An ISO 9001:2008 Certified Institution

Pollachi - 642 001

Coimbatore (Dt.) Tamil Nadu

NGM College

Vision

Our dream is to make the college an institution of excellence at the national level by imparting quality education of global standards to make students academically superior, socially committed, ethically strong, spiritually evolved and culturally rich citizens to contribute to the holistic development of the self and society.

Mission

Training students to become role models in academic arena by strengthening infrastructure, upgrading curriculum, developing faculty, augmenting extension services and imparting quality education through an enlightened management and committed faculty who ensure knowledge transfer, instill research aptitude and infuse ethical and cultural values to transform students into disciplined citizens in order to improve quality of life.

DEPARTMENT OF ZOOLOGY

Vision

Enlightening the students with total dedication to bring out the hidden skills, creativity and human excellence with due emphasis on knowledge about recent development in the field of biology and mould them as responsible citizens.

Mission

Metamorphosing the students holistically through seminars, symposia, guest lectures, group discussions, shared class experiences, assignments, nature club, job opportunities, and healthy practices to express the excellence within.

Scheme of Examination

Part No	Course Code	Course title	Lecture+ Practical Hours/ week	Duration of Exam Hrs	Max. Marks			Credit Point
					Internal	End-of-Semester	Total	
Semester I								
I	18UTL101	Tamil/Hindi Paper - I	6	3	25	75	100	3
II	18UEN101	English Paper - I	5	3	25	75	100	3
III	18UZY101	Core Major Paper - I Non-Chordata	6	3	25	75	100	4
		Practical - I (Non-Chordata & Chordata)	2	-	-	-	-	-
	18UBV1A1	Allied Botany Paper-I: Non-Chordata & Chordata	6	3	25	75	100	4
		Allied Botany Practical- (Paper-I & II)	2	-	-	-	-	-
IV	18UHR101	Human Rights	1	2	-	50	50	3
	18HEC101	HE - (Personal values & SKY Yoga practice -I)	1	2	25	25	50	1
V	18UNC401/ 18UNS 402/ 18USG 403	NCC NSS Sports & Games						
							500	17
Semester II								
I	18UTL202	Tamil/ Hindi Paper - II	6	3	25	75	100	3
II	18UEN202	English Paper - II	5	3	25	75	100	3
III	18UZY202	Core Major Paper - II: Chordata	5	3	25	75	100	4
	18UZY203	Major Practical - I (Non-Chordata & Chordata)	2	3	40	60	100	4
	18UBV2A2	Allied Botany Paper-II: Economic Zoology	6	3	25	75	100	4
	18UBV2A3	Allied Botany Practical- (Paper I & II)	2	3	40	60	100	2
IV	18EVS201	Environmental Studies	2	2	-	50	50	2
	18HEC202	HE - Family values SKY Yoga practice -II)	1	2	25	25	50	1
V	18UNC401/ 18UNS 402/ 18USG 403	NCC NSS Sports & Games						
							700	23
Semester III								
I	18UTL303	Tamil/ Hindi Paper - III	5	3	25	75	100	3
II	18UEN303	English Paper - III	6	3	25	75	100	3
III	18UZY304	Core Major Paper - IV Cell Biology	7	3	25	75	100	4
		Major Practical - II Cell biology & Genetics	2	3	-	-	-	-
	18UZY3A4	Allied Chemistry Paper- I	6	3	25	75	100	4
		Allied Chemistry Practical	2	-	-	-	-	-

IV	18UZY3N1/ 18UZY3N2	Public health and hygiene (NME) / Ornamental fish culture (NME)/ Basic Tamil paper/ Ad Tamil paper	1	2	-	50	50	2
	18HEC303	HE - (Professional values & SKY Yoga practice -III)	1	2	25	25	50	1
V	18UNC401/ 18UNS 402/ 18USG 403	NCC NSS Sports & Games						
							500	17
Semester IV								
I	18UTL404	Tamil/ Hindi Paper - IV	5	3	25	75	100	3
II	18UEN404	English Paper - IV	6	3	25	75	100	3
III	18UZY405	Core Major Paper - V Genetics	7	3	25	75	100	4
	18UZY406	Major Practical - II Cell biology & Genetics	2	3	40	60	100	4
	18UZY4A5	Allied Chemistry Paper - II	6	3	25	75	100	4
	18UZY4A6	Allied Chemistry Practical	2	3	40	60	100	2
IV	18UZY4N3/ 18UZY4N4	Food and nutrition (NME) / Biopharmaceuticals (NME) / Basic Tamil paper/Ad Tamil paper	1	2	-	50	50	2
	18HEC404	HE - (Social values & SKY Yoga practice -IV)	1	2	25	25	50	1
V	18UNC401/ 18UNS 402/ 18 USG 403	NCC NSS Sports & Games				50	50	1
							750	24
Semester V								
III	18UZY507	Core Major Paper - VII Developmental Biology & Endocrinology	5	3	25	75	100	4
	18UZY508	Core Major Paper - VIII Biotechnology	5	3	25	75	100	4
	18UZY509	Core Major Paper - IX Biostatistics & Biophysics	5	3	25	75	100	4
	18UZY617	Major Practical - III Developmental biology & Endocrinology, Biostatistics & Biophysics, Animal Physiology & Biochemistry and MLT	2	-	-	-	-	-
	18UZY618	Major Practical - IV Ecology, Evolution, Biotechnology, Microbiology Sericulture and Aquaculture	2	-	-	-	-	-
	18UZY510	Core Elective Paper I Medical Laboratory Technique	4	3	25	75	100	5
	18UZY511	Core Elective II Bioinformatics and Information	3	3	25	75	100	5

IV	18UZY5S1/ 18UZY5S2	Security Apiculture (SBE)	1	2	-	50	50	2
		Insert pest management (SBE)						
	18GKL501	General Knowledge & General Awareness (SBE)	55	2		50	50	2
	18HEC505	HE - [National values & SKY Yoga practice -V]	1	2	25	25	50	1
							650	25
Semester VI								
UI	18UZY612	Core Major Paper - XII Animal Physiology & Biochemistry	5	3	25	75	100	5
	18UZY613	Core Major Paper - XIII Ecology & Evolution	5	3	25	75	100	4
	18UZY614	Core Major Paper - XIV Microbiology & Immunology	5	3	25	75	100	4
	18UZY615	Core Major Paper - XV Sericulture	4	3	25	75	100	3
	18UZY616	Core Elective - III Aqua culture	5	3	25	75	100	5
	18UZY617	Major Practical - III Developmental biology & Endocrinology, Biostatistics & Biophysics, Animal Physiology & Biochemistry and MLT	2	3	40	60	100	4
	18UZY618	Major Practical - IV Ecology, Evolution, Biotechnology, Microbiology, Sericulture and Aquaculture	2	3	40	60	100	4
IV	18UZY6S3/ 18UZY6S4	Vermiculture (SBE) Poultry science and management technology (SBE)	1	2		50	50	2
	18HEC606	HE - [Global values & SKY Yoga practice -VI]						
			1	3	25	25	50	1
							800	34
**Grand total							3900	140

List of Part - V Subjects

S.No	Subject Code	Subjects
1.	18 UNC 401	NCC
2.	18 UNS 402	NSS
3.	18 USG 403	Sports and Games
4.	18 URO 404	Rotract Club
5.	18 URH 405	Red Ribbon Club
6.	18 UVR 406	Youth Red Cross
7.	18 UCA 407	Consumer Awareness Club
8.	18 UED 408	Entrepreneurship Development Cell
9.	18 UCR 409	Center for Rural Development
10.	18 USS 410	Student Guild of Service
11.	18 UGS 411	Green Society
12.	18 UEO 412	Equal Opportunity Cell
13.	18 UFA 413	Fine Arts Club

**General Question Pattern
PART I, II & III**

Max. Marks: 100	Internal : 25	External : 75	
Section	Pattern	Mark	Total
Part A	1-5 Multiple choice with 4 options (One question from each unit)	10X1	10
	6-10 Short answers (One question from each unit)		
Part B	11-15 Either / Or type (One question from each unit)	5X5	25
Part C	16-21 Four out of six (Question no. 16 is compulsory)	4X10	40
Total : 75			

Question Pattern for PART -IV

Max. Marks: 100	External : 50		
Section	Pattern	Mark	Total
Part A	1-5 Multiple choice with 4 options	5X1	5
	6-10 Short answers (One question from each unit)	5X1	5
Part B	Answer any questions five out of eight (11-18)	5X8	40
Total : 50			

CIA: Test - I : 2.5 Units

Test - II : Remaining 2.5 Units

Bloom's Taxonomy Based Assessment Pattern

K1-Remember ; **K2**-Understanding ; **K3**-Apply ; **K4**-Analyze ; **K5**- Evaluate

1. Theory: 75 Marks

(i) TEST- I & II and ESE:

Knowledge Level	Section	Marks	Description	Total
K1 & K2	A (Answer all)	10x1=10	MCQ/Define	75
K3	B (Either or pattern)	5x5=25	Short Answers	
K4	C (Answer 4 out of 6)	4x10=40	Descriptive/ Detailed	

2. Theory: 50 Marks

Knowledge Level	Section	Marks	Description	Total
K1	A (Answer all)	10x1=10	MCQ/Define	50
K2 & K3	B (Either or pattern)	5 x 8=40	Detailed Answers	

3. Practical Examinations:

Knowledge Level	Section	Marks	Total
K3	Practicals. & Record work	60	100
K4		40	
K5			

Components of Continuous Assessment

Components		Calculation	CIA Total
Test 1	75	$\frac{75+75+25}{3}$	25
Test 2	75		
Assignment/Seminar	25		

Programme Outcomes

PO1. To obtain knowledge in taxonomic position of animals and know the morphology and anatomy of Non-Chordates and Chordates.

PO2. The graduates can acquire knowledge along with the hands on experience in the life or job oriented subjects like vermiculture, sericulture, apiculture, aquaculture, Medical laboratory techniques, microbiology, animal tissue culture, bioinformatics etc.

Programme Specific Outcomes

PS01	Impart awareness of the conservation of the biosphere.
PS02	Understand the unity of life with the rich diversity of organisms and their ecological and evolutionary significance
PS03	To acquire knowledge in the ecological, economical and biological significance of the animals
PS04	To develop the awareness of health and hygiene for the society
PS05	To know the communicable, non-communicable, hereditary and major killer diseases.

Verified by HOD Name and Signature Dr. P. R. Balasubramanian		Checked by CDC Dr. M. Durairaju		Approved by COE Dr. R. Muthukumaran	
Signature:		Signature:		Signature:	
Programme code:	B.Sc	Programme Title :	Zoology		
Course Code:	18UZY101	Title	Batch :	2018-2021	
		Non -Chordata	Semester	I	
Hrs/Week:	6		Credits:	4	

Course Objective

- To understand the different animal groups under different phyla

Course Outcomes (CO)

K1	CO1	To remember the outline Classification of Nonchordata
K2	CO2	To understand the structure and inter-relationship between non-chordate animals.
K3	CO3	To deploy the each phylum with an example
K4	CO4	To discuss the general topics of each phylum

Unit	Content	Hrs
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Unit I	Outline Classification upto class level with two examples each. General characteristics of under mentioned Non-Chordate phyla (Ekambaranatha Iyer Text book to be followed) Phylum – Protozoa: <i>Plasmodium vivax</i> – structure Life cycle – Cycle of Golgi - Cycle of Ross <i>Pathogenicity and control of Malaria</i> <i>Economic importance of Protozoa</i>	16Hrs
Unit II	Phylum – Porifera: <i>Leucosolenia</i> – Structure – Reproduction and Life cycle <i>Canal system in sponges</i> Phylum – Coelenterata: <i>Obelia</i> – Structure – Reproduction and Life cycle Polymorphism Coral reefs – Types and Formation.	16Hrs
Unit III	Phylum – Helminthes: <i>Toxoplasma</i> – Structure Reproductive system and Life cycle. <i>Parasitic adaptations in Helminths were:</i> Phylum – Annelida: Earthworm – Structure - Digestive system - Excretory system and Reproductive systems <i>Metamerism in Annelids.</i>	15Hrs
Unit IV	Phylum – Arthropoda: Cockroach – Structure - Mouth parts – Digestive – Respiratory – Circulatory – Nervous and Reproductive systems. <i>Peripatus as a Connecting Link</i> Arthropod Vectors and Human diseases.	15Hrs
Unit V	Phylum – Mollusca: Pila – Structure Respiratory system and Reproductive Systems. <i>Economic importance of Mollusca</i> Phylum – Echinodermata: Sea star – Structure- Digestive system Water vascular system and Reproductive systems. Larval forms of Echinoderms and their significance.	16Hrs
Total Contact Hrs		78Hrs

* *Italics denoted as self study topics*

Assignment, Seminar, Power point

Books for Study:

1. Nair N.C., Leelavathy S., Samdattapandian N and Arunigam, N. (2017) A text book of Invertebrates – Saras Publication, Nagarcoll.

Books for Reference:

1. Ekambaranatha Iyer. (1990) A Manual of Zoology, Part I & II, Invertebrata, Revised edition, S. Viswanathan(Printers and Publishers)
2. Jindan E.L & Verma J. K (1995) Invertebrate Zoology, S. Chand & Company, New Delhi
3. Dhani P.S & Dhani J.K (1990) Invertebrate Zoology, S. Chand & Company
4. Ganguly B.R Sinha A & Adhikari S. (1977) 3rd Edition Biology of Animals, Vol -I, Invertebrates New Central Book Agencies.
5. Kotpal R., Agarwal S.K & Khetarpal R.P. (1992) 7th Edition Modern Text Book of Zoology, Invertebrata, Rastogi Publications.

Mapping

PSU	PS01	PS02	PS03	PS04	PS05
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CO					
CO1	H	H	M	M	S
CO2	S	M	H	H	H
CO3	M	M	S	M	M
CO4	H	H	M	H	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature		Verified by HOD Name and Signature		Checked by CDC		Approved by COE	
Ms. S. Jayalakshmi		Dr. P. R. Balasubramanian		Dr. M. Durairaju		Dr. R. Muthukumaran	
Signature:		Signature:		Signature:		Signature:	
Programme code:		B. Sc		Programme Title :		Zoology	
Course Code:		18UZY203		Title		Batch :	
				Major Practical -I		Semester	
				Non - Chordata and Chordata		2018-2021 I & II	
Hrs/Week:		2				Credits:	
						4	

Course Objective

- To study the morphology and anatomy of invertebrates and vertebrates

Course Outcomes (CO)

K3	CO1	To remember external and internal features of organisms
K4	CO2	To understand the unity of life with the rich diversity of organisms and their ecological and evolutionary significance
K5	CO3	To evaluate the conservation awareness of the biosphere by field visit

CONTENT

1. Identifying the virtual specimen exposed in monitor /dissect the virtual specimen and label it and comment on it with suitable diagram

1. Non-Chordata – Cockroach

- External Male
- External Female
- Digestive system
- Nervous system
- Male Reproductive system
- Female Reproductive system

2. Chordata – Frog

- External
- Digestive system
- Heart
- Brain
- Limbs
- Male Urino-genital system
- Female Urino-genital system

2. SPOTTERS

- A. Classify giving reasons:

- 1) Plasmodium
- 2) Obelia
- 3) *Taenia solium*
- 4) Earth worm
- 5) Cockroach
- 6) Sea star
- 7) Shark
- 8) Frog
- 9) Calotes
- 10) Pigeon

- B. Draw labeled sketch:

- 1) Obelia Medusa
- 2) T.S of *Taenia solium*
- 3) T.S of Earthworm
- 4) Cockroach- Mouth parts
- 5) Frog – Pectoral girdle
- 6) Frog – pelvic girdle
- 7) Poison apparatus – snake
- 8) Pigeon – Symsacrum
- 9) Pigeon – flight muscle
- 10) Human Brain

- C. Biological significance:

- 1) Sponge- Gemmule
- 2) Corals
- 3) Peripatus
- 4) Limulus
- 5) Bipinnaria Larva
- 6) Balanoglossus
- 7) Amphioxus
- 8) Axolotl larva
- 9) Hyla
- 10) Chamaeleon

- D. Write descriptive notes:

- 1) *Taenia solium* – Scolex
- 2) Earth worm - setae
- 3) *Penaeus*

- 4) Pila – Radula
- 5) Rhacophorus
- 6) Draco
- 7) Cobra
- 8) Emu
- 9) Monotremes – Echidna
- 10) Marsupials – Kangaroo

3. Field Visit/Project (Select A or B option)

The student has to maintain a log book showing the progress of the field/project work, duly signed by the supervising teacher and may be shown to the external examiner at the time of end of semester practical examination.

A. Individual activity

Identification of invertebrate and vertebrate species available in campus/field without disturbing the natural habitat

Field/project/tour report and photographs to be submitted

B. Group Activity

A maximum of three students can choose any one group of activity any matter of zoological interest and submit the report for external practical examination.

Viva

Experiences of field visit and report preparation should be present.

4. Record

Total Contact Hrs

52

Experience; Discussion, activity, Field visit, Report Preparation

Books for Reference:

1. Lal, S. S. (2004) A text book of Practical Zoology Invertebrate. Rastogi Publications, Shivaji Road, Meerut, 250 002, India
2. Lal, S. S. (2004) A text book of Practical Zoology Vertebrate. Rastogi Publications, Shivaji Road, Meerut, 250 002, India
3. www.froguts.com
4. www.sciencelabs.com
5. www.ento.vt.edu
6. www.petaindia.com

Mapping

CO	PS0	PS01	PS02	PS03	PS04	PS05
	C01	H	H	H	M	H
	C02	H	M	M	H	M
	C03	M	M	M	H	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. P. R. Balasubramanian	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	18 UZY1A1	Title	Batch : 2018-2021
		Ancillary Botany Paper – I Non-chordata and chordata	Semester 1
Hrs/Week:	6		Credits: 4

Course Objective

- To study the structure and classification of different animal kingdom.
- To understand the general characters of both chordate and non-chordate phyla

Course Outcomes (CO)

K1	CO1	To remember animal external characters and its kingdom wise classification
K2	CO2	To comprehend animal systems and its peculiar characters
K3	CO3	To execute animal general characters and classification strategies

R4	CU4	Topics of animal classification system and its importance	
Unit		Content	Hrs
Unit- I		Classification of the following Phyla up to the class level with suitable examples. Phylum: Protozoa: Paramecium – Structure- Feeding- Binary fission and Conjugation Phylum: Coelenterata: Obelia – Structure and Life cycle.	19Hrs
Unit- II		Phylum: Platyhelminthes : <i>Taenia solium</i> – Structure – Reproduction and Life cycle. Phylum: Arthropoda: <i>Cockroach</i> – Structure Mouthparts, Digestive system – Respiratory system and Reproductive system.	18Hrs
Unit- III		Phylum: Mollusca : Freshwater mussel – Structure – Digestive system- Respiratory system – Circulatory system – Reproductive system. Phylum: Echinodermata: Sea star – Structure and Water Vascular system.	18Hrs
Unit- IV		Phylum: Chordata Sub Phylum: Prochordata – General Characters of Amphioxus, Balanoglossus, Ascidian Sub Phylum: Vertebrata – Class : Pisces Shark – External Characters – Digestive & Urinogenital systems Class : Amphibia Frog – External characters – Respiratory system – Heart – Reproductive system.	18Hrs
Unit-V		Class: Reptilia Calotes – External characters- Circulatory system- Brain- Reproductive system. Class: Aves Pigeon – External Characters – Flight muscles – Respiratory system – Reproductive system. Class : Mammal Rabbit – External Characters – Heart – Excretory system – Reproductive system.	18Hrs
Total Contact Hrs			91

- *Italics denoted as self study topics*

Power point Presentations, Group discussions, Seminar, Assignment, Discussion

Books for Study:

Arumugam N. (2017) Allied Zoology Part I & Part – II -, Saras Publications, 114/35 G, A.R.K Camp Road, Peraiavillai, Kuttar PD, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Ekambaranatha Iyyer (1995) A Manual of Zoology Vol. I & II, Ananda Book Depot, "Aston Lodge", Mc Nichols Road, Cherput, Madras – 600 031
2. Jordan E.L & Verma J.B. (1997) Invertebrate Zoology, S. Chand & Company Ltd, Ram Nagar, New Delhi 110055
3. Dhami P.S & Dhami J.K (1995) Invertebrate Zoology, S. Chand & Company
4. Ganguly B.B, Sinha A & Adhikari S. (1977) 3rd Edition Biology of Animals, Vol. –I, Invertebrates., New Central Book Agencies
5. Korpel R.L (1983) Modern Text Book of Zoology, Rastogi Publications

6. Nigam Shoban I Naginhand H.C. [1995] Biology of Non-Chordates, Shoban I Nagin hand & Co Educational & Publishers.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Somasundaram Signature:	Dr. P. R. Balasubramanian Signature:	Dr.M.Duraiaraju Signature:	Dr.R.Muthukumaran Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	18UZY2A3	Title	Batch :	2018-2023
		Ancillary Botany Practical – (Paper I & II)	Semester	I & II
Hrs/Week:	2		Credits:	4

Course Objective

- To study the morphology and anatomy of invertebrate and vertebrate
- To study the ecological and biological significance of the animals

Course Outcomes (CO)

K3	CO1	To remember the anatomical and morphological structure of animals and micro organisms
K4	CO2	To understand the ecological and biological importance of vertebrates and invertebrates
K5	CO3	To validate the practical efficiency in the animal kingdom structure and function

CONTENT

1. Identifying the virtual specimen exposed in monitor /dissect the virtual specimen and label it and comment on it with suitable diagram

1. Non-Chordata – Cockroach

- External Male
- External Female
- Digestive system
- Nervous system
- Male Reproductive system
- Female Reproductive system

2. Chordata – Frog

- External
- Digestive system
- Heart
- Brain
- Limbs
- Male Urinogenital system
- Female Urinogenital system

2. SPOTTERS

A. Classify giving reasons:

- 1) Paramecium
- 2) *Taenia solium*
- 3) Penaeus
- 4) Sea star
- 5) Amphioxus
- 6) Calotes
- 7) Pigeon
- 8) Rabbit

B. Draw labeled sketch:

- 1) Obelia colony
- 2) *Taenia solium* – Scolex
- 3) Frog – Pectoral girdle
- 4) Calotes – Brain
- 5) Snake – Poison apparatus
- 6) Pigeon – Quill feather
- 7) Rabbit – Dentition
- 8) Human – Digestive system

C. Biological significances:

- 1) Obelia Medusa
- 2) Balanoglossus
- 3) Honey bee
- 4) Culex mosquito
- 5) Earthworm
- 6) Salamander
- 7) Silkworm
- 8) Kangaroo

D. Write descriptive notes:

- 1) Paramecium – conjugation

- 2) Gold fish
- 3) Sea horse
- 4) Foot and mouth disease virus
- 5) Bird flu virus
- 6) Tortoise
- 7) Owl
- 8) Bat

3. Identification of fauna and report submission

4. Record

Total Contact Hrs

52

Experience Discussion, Activity, Case study

Books for Reference:

1. Arumugam N. (2017) Practical Zoology (Invertebrata Volume -I) First edition. Saras publication, Nagarcoll, Kanyakumari
2. Arumugam N. (2017) Practical Zoology Chordata Volume -II First edition. Saras publication, Nagarcoll, Kanyakumari

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Sumasundaram	Dr. P. R. Balasubramanian	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc	Programme Title :	Zoology
Course Code:	18UZY202	Title:	Chordata
Hrs/Week:	5	Batch :	2018-2021
		Semester	II
		Credits:	4

Course Objectives

- To acquire a basic knowledge on chordates

Course Outcomes (CO)

K1	CO1	To keep in mind the outline Classification of Chordata
K2	CO2	To understand the morphology and anatomy of vertebrates
K3	CO3	To execute interrelationship between Each class
K4	CO4	To discuss the biodiversity of chordates

Unit	Content	Hrs
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Unit I	General characters and outline classification of Phylum Chordata, up to class level with suitable examples. (Ekambaranatha Iyer Text Book to be followed) General characters and affinities of a) Amphioxus b) Balanoglossus c) Ascidian Class: Pisces Type – Shark Systems: External - Digestive system - Respiratory and Urino-genital system. ♦ Parental care in Fishes	13Hrs
Unit II	Class: Amphibia Type – Frog Systems: External - Girdles and Limbs - Respiratory system - Brain - Cranial nerves and Urino-genital system. ♦ Origin of Amphibia.	13Hrs
Unit III	Class: Reptilia Type – Calotes Systems: External - Digestive system - Urino-genital system. ♦ South Indian Poisonous and Non-Poisonous Snakes ♦ Poison apparatus and Biting Mechanism in Snakes - First Aid for Snake Bite :-	13Hrs
Unit IV	Class: Aves Type: Pigeon Systems: External - Synsacrum - Flight muscles - Digestive system - Respiratory system - Brain - Eye and Urino - genital system. ♦ Flightless Birds ♦ Migration in Birds	13Hrs
Unit V	Class: Mammalia Type – Homo sapiens Systems: Digestive system - Respiratory system - Heart - Brain - Eye - Ear - Urinary and Reproductive system. ♦ Salient features of Monotremes Marsupials. ♦ General Essay Evolution of aortic arches.	13Hrs
Total Contact Hrs		65Hrs

- Italics denoted as self study topics

Assignment, Seminar

Books for Study:

1. Thangamani, A., Prasanna kumar, S., Narayanan, L.M., and Arumugam, N. (2017) (8th Edition) A text book of Chordata, Saras publications, 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PQ, Nagercoil-629 002, Kanyakumari

Books for Reference:

1. Ekambaranatha Iyer, (1995) Manual of Zoology, Vol.II (4th Edition), S.Viswanathan PVT Ltd., Parts I & II, Viswanathan & Co.
2. Jordan, E.L. and Verma, P.S. (2006) Chordate Zoology, S. Chand & Company LTD., Ram Nagar, New Delhi, 110055.

Mapping

CO	PS0	PS01	PS02	PS03	PS04	PS05
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CO1	H	S	M	H	H
CO2	M	M	H	H	M
CO3	S	H	S	M	M
CO4	M	M	H	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. P. R. Balasubramanian	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	1BUZY2A2	Title	Batch : 201B-2021
		Ancillary Botany Paper – II	Semester II
		Economic Zoology	
Hrs/Week:	6	Credits:	4

Course Objective

- To understand the applications of Zoology for developing skills
- To study the ecological and economical aspects of bee keeping, silkworm rearing, poultry keeping, dairy farming ,aquaculture

Course Outcomes (CO)

K1	CO1	To remember zoological application in day to day life
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K2	CO2	To get the idea of ecological and economical application of modern zoology
K3	CO3	To apply zoological knowledge in self employment and functional ecology
K4	CO4	To sort of technical ecological and economical knowledge in the zoology

Unit	Content	Hrs
Unit-I	AQUACULTURE • Scope of Aquaculture • Types of Fisheries 1. Inland fisheries 2. Marine fisheries • Culturable organisms 1. Fin fishes • Oyster culture 1. Edible oyster 2. Pearl oyster 3. Pearl formation	16Hrs
Unit-II	APICULTURE • Scope of Apiculture • Brief account of <i>A. indica</i>, <i>A. mellifera</i> and <i>A. dorsata</i> • Structure of Bee Hive • Products of Bee Keeping 1. Royal jelly 2. Honey 3. Wax 4. Bee venom • Appliances used for modern method of Bee Keeping VERMICULTURE • Economic importance of Earthworm • Vermibed preparation • Vermiwash	16Hrs
Unit-III	SERICULTURE • Optimum conditions for mulberry growth • Mulberry cutting preparation • Structure of silkworm • Structure of silk gland • Life cycle of <i>Bombyx mori</i> • Rearing appliances • Disinfection • Diseases of silkworm 1. Pebrine 2. Viral flacherie • Cocoon market	16Hrs
Unit-IV	DAIRY FARMING • Scope of dairy farming • Live stock in India • A typical dairy farm(dairy house) • Dairy animals; cow • Live stock diseases 1. Mastitis 2. Foot and Mouth disease(FMD) • Nutritive value of milk • Dairy By-products	15Hrs
Unit-V	POULTRY KEEPING	15Hrs

	• Construction of poultry house • Rearing of Broilers • Rearing of Layers • Diseases of poultry 1. Fowl pox 2. Coccidiosis 3. Ranikhet disease 4. Bird Flu • <i>Nutritive value of Egg</i>	
Total Contact Hrs		78

- *Italics denoted as self study topics*

Power point Presentations, Seminar , Assignment, Discussion, Case study

Books for Study:

1. Arumugam, N. (2017) Applied Zoology, Saras Publication, 114/35 G ARP Camp Road, Periyavilai, Nagercoil, Kanyakumari – 629 002

Books for Reference:

1. Ganga and Sulochana Chetty. (1999) An introduction to sericulture, 2nd Edition, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi
2. Arumugam, N.(2013) Economic Zoology, 1st edition, Saras Publication, 114/35 G ARP Camp Road, Periyavilai, Nagercoil, Kanyakumari – 629 002
3. Shukla & Upadhyay,(2001) Economic Zoology - Rastogi Publication, Shivaji Road, Meerut 250 002
4. Arumugam, N. (2012) Aquaculture -, 1st edition, Saras Publication, 114/35 G ARP Camp Road, Periyavilai, Nagercoil, Kanyakumari – 629 002
5. Ezhili, N. & Thirumathal, K. (2008) A hand book for sericulture, Shrishti Impression, Coimbatore
6. Tripathy, S.N. (2004) Food biotechnology, Doarinant Publishing and distributions, New Delhi. 110 002.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medum; L-Low

Unit	Content	Hrs
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Course Designed by Name and Signature	Verified by HoD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Somasundaram Signature:	Dr. P. R. Balasubramanian Signature:	Dr.M.Durairaju Signature:	Dr.R.Muthukumaran Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	18UZY304	Title	Batch : 2018-2021
		Cell Biology	Semester III
Hrs/Week:	7		Credits: 4

Course Objective

- To study the basic concepts of cell biology
- To acquire the basic knowledge about recent development in cell biology

Course Outcomes (CO)

K1	CO1	To remember the overview of cells and their origin and evolution.
K2	CO2	To get the fundamental ideas of prokaryotic and eukaryotic cell.
K3	CO3	To deploy the structure and functions of cell organelles.
K4	CO4	To sort of cell constituents and their biological activities.

Unit I	Cell Theory: Salient features - Protoplasm theory - Germplasm theory and organismal theory <i>Scope of Cell Biology</i> Virus - HIV - Prokaryotic Cell (<i>E.coli</i> bacterium) - Eukaryotic Cell (Typical animal cell) Organelles: Plasma membrane Structure - Trilaminar model - Biomolecular leaflet model and Fluid mosaic model. General functions of plasma membrane.	19Hrs
Unit II	Endoplasmic Reticulum: Ultra Structure - Rough and Smooth types - Functions. Ribosomes: Types - Chemical composition - Biogenesis of 70s - Function Golgi complex: Structure and Functions. Lysosomes: Polymorphism - Enzymes and Functions	18Hrs
Unit III	Mitochondria: Structure - mtDNA - Origin - General functions. Nucleus: Ultra structure of interface nucleus and function. Nucleolus: Ultra structure and function. Chromosomes: Structure - Giant chromosomes - Polytene and Lamp brush.	18Hrs
Unit IV	Nucleic acids DNA Structure (Watson & Crick model) - Replication of DNA (Semi-conservative model) - Types of RNA Genetic Code - Salient features Protein synthesis - Central dogma and Central dogma reverse - Mechanism of protein synthesis - Components - Transcription and Translation.	18Hrs
Unit V	Cell division Cell cycle - Amitosis - Mitosis and Meiosis Cell death - Causes - Changes and Apoptosis Cancer cells Characteristics - Properties - Types - Diagnosis - Treatment and Oncogenes.	18Hrs
Total Contact Hrs		91

- Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment,

Books for Study:

- Arumugam N. (2017) Cell Biology — Saras Publication, 114/35 G, A.R.P Camp Road, Periyavallai, Kottar P.O, Nagercoil - 629 002, Kanyakumari

Books for Reference:

- Verma P.S. & Agarwal V.K (1993) Cytology - S.Chand & Company LTD, Ram Nagar, New Delhi - 110055
- Verma P.S. & Agarwal V.K (2006) Cell Biology, Genetics, Molecular Biology, Evolution and Ecology - S.Chand & Company LTD, Ram Nagar, New Delhi - 110055

3. Singh & Tomar, (2008). 9th revised edition Cell Biology –Rastogi Publications, Shivaji road, Meerut – 250 002, India.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	M
CO2	H	M	H	M	H
CO3	M	H	H	M	M
CO4	M	H	H	M	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Mariselvi Signature:	Dr. P. R. Balasubramanian Signature:	Dr.M.Duraiaraju Signature:	Dr.R.Muthukumaran Signature:
Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	18UZY406	Title Major Practical – II: Cell Biology and Genetics	Batch : Semester
Hrs/Week:	2		2018-2021 III & IV
			Credits: 4

Course Objective

- To know the measurements of microscopic objects.

Course Outcomes (CO)

K3	CO1	To keep in mind for identify the different stages of mitosis.
K4	CO2	To understand the concepts of genetics through experiments.
K5	CO3	To access the practical experience in instrument handling.

Syllabus

Content	Hrs
EXPERIMENTS - Measurements of cell using - Stage Micrometer and Ocular Micrometer - Squash preparation from Onion – Root tip – Mitosis - Identification of squamous epithelial cells in buccal smear. - Human Traits survey and gene frequency calculations. - ABO Blood grouping in man – Slide method. - Probability Test – Two coin tossing experiment. - Law of Segregation – Using color beads. - Law of Independent Assortment – Using color beads.	
SPOTTERS: CELL BIOLOGY - Human Immuno Deficiency Virus. E. coli Bacterium - A typical animal cell - Interface Nucleus - Lamp brush chromosome - Mitosis - stages - Meiosis - stages - DNA – Watson & Crick Model GENETICS - Drosophila – Male and Female - Gynandromorph - Hairy Pinna - Twins - Erythroblastosis Foetalis - Klinefelter's Syndrome - Down Syndrome - Turner's Syndrome - Free – martin - Sickle cell anemia	
Record	
Total Contact Hrs	52

Practical Experience, Activity

Books for Reference:

- Jaysura and Arumugam: N (2017) Practical Zoology Vol.3 Saras Publication, Nagarcoil, Tamil Nadu
- Lal, S. S. (2008). A text book of Practical Zoology. Rastogi Publications, Shivaji Road, Meerut.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	H	H
CO2	H	M	H	M	H
CO3	M	M	M	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Mariselvi Signature:	Dr. P. R. Balasubramanian Signature:	Dr.M.Durairaju Signature:	Dr.R.Muthukumaran Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	18UZY3N1	Title	Batch :
		Public Health and Hygiene(NME)	2018-2021
Hrs/Week:	1	Semester	III
		Credits:	2

Course Objectives

- To study the importance of health and hygiene for the society

Course Outcomes (CO)

K1	CO1	To remember the Health awareness
K2	CO2	To understand the communicable and non-communicable diseases
K3	CO3	To implement the Pollution free environment
K4	CO4	To discuss the importance of nutrition

Unit	Content	Hrs
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Unit I	• Introduction to public health • Health Indicators <i>Personal hygiene, Public health</i> • Health Dynamics of disease transmission – host, vectors and environment	3Hrs
Unit II	• Concepts of Health and diseases • Nutrition and Health Classification of food (Macro & Micro nutrients) • Nutritional deficiencies Vitamin and Mineral deficiencies • Balanced diet	3Hrs
Unit III	• Blood borne diseases – Hepatitis B and Hepatitis C • Kidney stone • Lipid deficiency diseases • Protein deficiency diseases	2Hrs
Unit IV	• Communicable diseases Measles, Cholera, Amebiasis, Malaria, Filariasis, AIDS • Non-Communicable Diseases Coronary heart Disease, Diabetes, Obesity, Stroke and Cancer	2Hrs
Unit V	• Health Education: Health care services in India Health Planning and Programmes in India Role of World Health Organization (WHO) in health education and Global health council • <i>First Aid and Nursing</i> Methods, Dressing, Care & Duties.	3Hrs
Total Contact Hrs		13

- *Italics denoted as self study topics*

Assignment, Seminar, power point

Books for References:

- 1) Park and Park (1995) Text book of Preventive and Socio Medicine, M/S. Banarsidas Bhanot Publishers, Jabalpur
- 2) Verma S. (1998) Medical Zoology. Rastogi Publications, New Delhi
- 3) Jordon, E.L. and Verma, P.S. (1995) Invertebrate Zoology, 12th edn. Sultan Chand & Co

Mapping

CO	PS0	PS01	PS02	PS03	PS04	PS05
	CO1	H	S	H	H	S
	CO2	H	H	H	S	H
	CO3	H	S	S	M	H
	CO4	S	H	H	H	S

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. P. R. Balasubramanian	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	18UZY3N2	Title	Batch :
		Ornamental Fish Culture (NME)	2018-2021
Hrs/Week:	1		Semester
			III
			Credits:
			2

Course Objective

- To study the various ornamental fishes and its culture

Course Outcomes (CO)

K1	CO1	To recollect the general ornamental fishes
K2	CO2	To understand the scope of fish culture
K3	CO3	To apply the ornamental fish culture methods for aquarium maintenance
K4	CO4	To review the different types of cultural methods

Unit	Content	Hrs
Unit I	• Scope of ornamental fish culture • General characteristic of fish • General structure of fish ◦ Digestive system ◦ Reproductive system	3Hrs
Unit II	• Materials, equipment required for aquarium • <i>Construction of home aquarium</i> • Structure and location of home aquarium	3Hrs
Unit III	• Selection of fish for home aquarium • <i>Common aquarium fishes</i>	2Hrs
Unit IV	• Fish feed • Natural fish feed • Artificial fish feed • Maintenance of home aquarium	2Hrs
Unit V	• Common disease of ornamental fishes • Fish parasites and control • Bioremedies for fish disease • Ornamental fish breeding- can rearing unit for entrepreneurs	3Hrs
Total Contact Hrs		13

- *Italics denoted as self study topics*

Power point Presentations, Seminar Assignment

Books for Study:

1. Arumugam, N. (2015) Aquaculture SARAS Publications, Nagertol, Tamilnadu

Books for Reference:

1. Dhote, A.K. (1985) Publication Department – NCERT – 55 Inland fishery – Instructional – cum – Practical – Manual Vol IV Aquaculture
2. Agarwal, S.C (1994) A hand book of fish farming, B.H.Enterprises, New Delhi.
3. Biswas, K. P. (1996) A Text book of fish & Fisheries Technology - Calcutta(W.B) 2nd Edition, Published by Narendra Publishing house, Delhi
4. Jhingran, V. G. (1988) Fish and Fisheries of India - Hindustan Publishing Corporation (India) Delhi, Printed in India at Gopsons papers Pvt Ltd, Noida

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	M	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr.P.R.Balasubramanian	Dr.P.R.Balasubramanian	Dr.M.Duraiaraju	Dr.R.Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	18UZY405	Title	Batch :	2018-2021
		Genetics	Semester	IV
Hrs/Week:	5		Credits:	4

Course Objective

- To Study the basic concepts of hereditary and variations.

Course Outcomes (CO)

K1	CO1	To keep in mind the genetic disorders in man.
K2	CO2	To understand the chemical basis of heredity.
K3	CO3	To deploy the heritable traits in families and populations.
K4	CO4	To sort of genetic concepts including health and diseases

Existing Syllabus

Unit	Content	Hrs
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Unit I	• Mendel's monohybrid and dihybrid experiments - Mendel's Laws & Problems. • Interaction of genes ◊ Lethal genes ◊ Epistasis • Polygenic inheritance: Skin colour in man 1:4:6:4:1 • Multiple alleles ◊ Coat colour in Rabbit ◊ ABO blood groups in man - Rh factor - problems	19Hrs
Unit II	• Linkage Complete and incomplete linkage • Chromosome maps: Interference and Coincidence - chromosome map in <i>Drosophila</i> (Three Point Cross) • Sex determination ◊ XX - XY type - Man ◊ ZZ - ZW type - Fowl ◊ Bridge's genic balance theory ◊ Hymenopteran type - Honey bee ◊ Gynandromorph - <i>Drosophila</i> ◊ Hormonal control - Free Martin Cattle.	18Hrs
Unit III	• Sex linked inheritance ◊ Eye colour in <i>Drosophila</i> ◊ Haemophilia and colour blindness in man - problems • Variation in chromosome number Euploidy and Aneuploidy • Syndromes ◊ Autosomal - Down syndrome and Patau's syndrome. ◊ Allosomal - Klinefelter's syndrome and Turner's syndrome	18Hrs
Unit IV	• Pedigree analysis • <i>Twins</i> • Inborn Errors of metabolism ◊ Phenylketonuria ◊ Alcaptonuria ◊ Albinism • Eugenics ◊ Positive ◊ Negative	18Hrs
Unit V	• Nucleic acids as genetic material DNA and RNA. ◊ Mutation: Detection of mutations - CIB method in <i>Drosophila</i> ◊ Molecular basis of gene mutation - Substitution mutations and Frame shift mutations • Population Genetics ◊ Gene pool ◊ Gene frequency and genotype frequency ◊ Hardy Weinberg law.	18Hrs
Total Contact Hrs		91

• *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment
Books for Study:

1. Meyyan R. P. (2017) 11th Edition, Genetics- Saras Publications, 114/35 G. A.R.P Camp Road, Periyavillai, Kottar PD, Nagercoil-629 002, Kanyakumari

Books for Reference:

1. Mighani G. S. (2002) 1st edition, Advanced Genetics, Narosa Publishing House, New Delhi, 110002.
2. Russell, J. (1987) 2nd edition, Essential Genetics, Black well Scientific Publication London
3. Verma and Agarwal (2008) 3rd edition, Genetics, S. Chand & Company, Ltd, New Delhi, 110055
4. Veer Bala Rastogi (2008) 9th edition, A text book of genetics, Kendriyanath, Meerut.
5. Gupta, P. K. (2007) 3rd edition, Genetics, Rastogi Publication, Meerut.
6. Kottari, L., et al., (2009) 5th edition Essentials of Human Genetics, University Press Private Ltd, Hyderabad, 500029.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	H	H
CO2	H	M	H	M	H
CO3	M	M	M	M	M
CO4	M	H	H	M	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Mariselvi	Dr. P. R. Balasubramanian	Dr. M. Durairaja	Dr. R. Muthukumar
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	18 UZY 4N3	Title	Batch : 2018-2021
		Food and Nutrition (NME)	Semester IV
Hrs/Week:	1	Credits:	2

Course Objective

- To understand the nutritive Values of various foods

Course Outcomes (CO)

K1	CO1	To recollect the concept of nutritive foods.
K2	CO2	To understand the energy values of various foods.
K3	CO3	To apply the importance of food chart.

K4	CD4	To analyze the food deficiency diseases
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Unit	Content	Hrs
Unit I	- The scope of food and nutrition - Composition of food (Protein –Carbohydrate – Fat-Vitamins and Minerals) - Function and sources of food	3Hrs
Unit II	- Measurement of energy and energy values of various food - Nutritional requirements - children, adolescence, old age - Balances diet <i>Digestion and absorption</i>	3Hrs
Unit III	- Milk – Types - importance in the diet - Eggs – Structures and composition – importance in the diet - Meat – Types – importance in the diet	2Hrs
Unit IV	- Fish – Types - importance in the diet - Vegetables – Types - importance in the diet - Fruits – Types - importance in the diet - Cereals and pulses– Types- importance in the diet	2Hrs
Unit V	- Food spoilage - Food poisoning- food borne diseases - Food adulteration <i>Methods of purification of potable water</i> - Food laws	2Hrs
Total Contact Hrs		13

- Italics denoted as self study topics*

- Assignment ,Seminar

Books for Study:

- Anita Tull, (1987) 1st edition. Food and nutrition – Oxford University press, Cambridge
- Srlakshmi, B. (2012) 5th edition. Food Science, New age International Publishers, New Delhi

Books for Reference:

- Swaran Pasran Pasricvha, (2000) 1st edition. Count what you eat – NIN – Hyderabad
- Tripathy, S. N. (2004) 1st edition. Food Biotechnology, Dominant Publishes and distributors, New Delhi- 110002
- Srlakshmi, B. (2012) 6th edition. Dietetics, New age International Publishers, New Delhi

Mapping

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	S	H	H	M	S
	CO2	S	M	S	M	S
	CO3	H	H	H	H	H
	CO4	M	S	M	H	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature		Verified by HOD Name and Signature		Checked by CDC		Approved by COE	
Dr. S. Somasundaram		Dr. P. R. Balasubramanian		Dr. M. Durairaju		Dr. R. Muthukumaran	
Signature:		Signature:		Signature:		Signature:	

Course Objectives

- To enable the students to know the actual path of metabolism of drugs and drug discovery.

Course Outcomes (CO)

K1	CO1	To keep in mind the Routes of administration in biological systems and models
K2	CO2	To understand the drug metabolism
K3	CO3	To implement the microbial products in pharmaceutical industry
K4	CO4	To discuss the DNA technology in Pharmaceutical products

Unit	Content	Hrs
Unit I	Biological systems and models: Routes of administration- adsorption- enhancement- bioavailability- site specific delivery; Pharmacodynamics of protein therapeutics- Inter species scaling	3hrs
Unit II	Drug metabolism: Oxidation- reduction- hydrolysis- conjugation. Need for developing new drugs; Procedure followed in drug design; Prodrug and soft drugs; Drug toxicity.	3hrs
Unit III	Drug discovery & cardiovascular drugs: Substances derived from bacteria- plants- insects- and animals; Sources of active principles; drugs used in atherosclerosis	3hrs
Unit IV	Pharmaceutical products: Microbial products - Antibiotics (penicillin- streptomycin- tetracycline)- <i>vitamins</i> - probiotics, Animal vaccines- Anti platelets drugs.	2hrs
Unit V	Pharmaceutical products of DNA technology: Therapeutic proteins - Insulin- human growth hormone- Diuretics- clotting factors- Vector usage strategies for gene therapy; <i>Clinical trials</i>	2hrs
Total Contact Hrs		13

- *Italics denoted as self study topics*

- Assignment, Seminar

Books for Reference:

1. Heinrich Klevenz, (2002) "Industrial Pharmaceutical Biotechnology", WILEY-VCH Publication, Germany.
2. Olan Crommelin, & Robert D Sindelar, (2002) "Pharmaceutical Biotechnology", Taylor and Francis Publications, New York.
3. Jay P Rho and Stan G Louis, (2003) "Hand book of Pharmaceutical Biotechnology", Pharmaceutical products press, New York.
4. Lachman I, Lieberman, HA, and Kanig, L, (1986) "Theory and practice of industrial pharmacy", 3rd edition, Varghese publishing & Co, New Delhi.
5. Remington's Pharmaceutical sciences, (2000) 18th edition, Mack publishing & Co, Easton, PA

Mapping

CO	PS0	PS01	PS02	PS03	PS04	PS05
	CO1	S	S	M	H	S
	CO2	H	M	H	H	H
	CO3	M	S	S	M	M
	CO4	M	H	H	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. P. R. Balasubramanian	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	18 UZY 507	Title	Batch : 2018-2021
		Developmental Biology and Endocrinology	Semester V
Hrs/Week:	5		Credits: 4

Course Objective

- To understand the basic concepts and definitions of modern developmental biology
- Identify and define the landmark events and advances in developmental biology.
- To know about the endocrine glands and their functions

Course Outcomes (CO)

K1	CO1	To remember the steps and advancements in the developmental biology and endocrinology
K2	CO2	To comprehend embryonic formation and developmental stages with suitable example and morphological and functional status of endocrine glands
K3	CO3	To apply functional knowledge on developmental biology into the frontier sciences
K4	CO4	To sort of embryonic development and its functional applications and functional morphology of endocrine glands

Unit	Content	Hrs
Unit-I	• Definition-Ontogeny – Phylogeny Programme of Developmental Biology • Theories Pre formation Spemann's experiments on Organizer • Gametogenesis Spermatogenesis Oogenesis • Fertilization Mechanism <i>In Vitro Fertilization (IVF)</i> Parthenogenesis- Natural and Artificial • Significance of Parthenogenesis.	13Hrs
Unit-II	• Cleavage Planes (Meridional, Vertical, Equatorial and Latitudinal) Patterns of cleavage (Holoblastic and Meroblastic) Example: Cleavage in frog • Gastrulation Types of morphogenic movements (Epiholy & Emboly). • Mechanism of morphogenetic movements Example: Gastrulation in frog. • Exo gastrulation • Fate map • Development and significance of fetal membranes in chicks	13Hrs
Unit-III	• Organogenesis in Frog -Ectodermal (Brain) -Mesodermal (Heart) -Endodermal (Alimentary canal) • Placentation in mammals Classification based on -Fetal membranes -Distribution of villi -Histology • Functions of placenta • Stem cells: embryonic & adult • <i>Embryonic stem cell culture and applications.</i>	13Hrs
Unit- IV	• Endocrinology-Definition • Endocrine glands [Structure & Functions] Thyroid Parathyroid Pancreas Testes & ovary • Hormonal interactions- Feedback control mechanisms.	13Hrs
Unit-V	• Mechanism of hormone action: peptide, steroid & thyroid.	13Hrs

	Hormonal disorders: Pancreas (Diabetes mellitus) Thyroid (Goiter) Pituitary (Gigantism – Dwarfism) Sex hormones (Infertility).	
Total Contact Hrs		65

- Topics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Discussion, Activity

Books for Study:

- Arumugam, N. (2017) Developmental Zoology - Saras Publication, 114/35G, A.R.P Camp Road, Periyavilal, Kuttar Post, Nagercoil - 629002, Tamilnadu, India. 2011
- Venna P S & Agarwal V R (2012) Chordate embryology - S Chand & Company Ltd

Books for Reference:

- Bertill, W J and Craw M C. (2010) Developmental biology - Hill Book Co. New York.
- Wesley, (1979) An Outline of animal development – Davenport, Addison - publishers, University of Michigan.
- Balinsky, 5th Edition, Embryology - Philadelphia, Saunders College Publishing.
- Sreenkumar S. (2010) Edition, Basic Physiology -, PHI Learning Pvt. Ltd, New Delhi.
- Sastri, K.V. (2009-2010) Endocrinology & Reproductive Biology - Rastogi Publications, Shivaji road, Meerut-250002, India.
- Prakash S, Lohar, (2005) Endocrinology, MJP Publishers, Chennai.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by		Verified by HOD		Checked by		Approved by	
Name and Signature		Name and Signature		CDC		COE	
Dr. S. Sathasundaram		Dr. P. R. Balasubramanian		Dr. M. Duraisaju		Dr. R. Muthukumarasu	
Signature:		Signature:		Signature:		Signature:	
Programme code:	B.Sc	Programme Title :			Zoology		
Course Code:	18UZY5Q8	Title:			Batch :	2018-2021	
		Biotechnology			Semester:	V	
Hrs/Week:	5				Credits:	4	

Course Objective

- To study the basics of biotechnology
- To understand the different application of biotechnology.

Course Outcomes (CO)

K1	CO1	To keep in mind about the basic technology of Biotechnology
K2	CO2	To understand the different blotting techniques, PCR and DNA Fingerprinting.

K3	CO3	To apply the cell culture techniques combined with transgenic animal culture
K4	CO4	To analyze the application of biotechnology and make interest in Biosafety Measure.

Unit	Content	Hrs
Unit I	• Introduction- scope and importance of biotechnology • Plasmids pBR 322 • Cosmids • Transposons • Gene map of λ DNA • Construction of recombinant DNA	13Hrs
Unit II	• Blotting Techniques: ➤ Southern Blotting ➤ Northern Blotting ➤ Western Blotting • Polymerase Chain Reaction (PCR) – Applications of PCR in Biotechnology • DNA Finger printing • <i>Genomic library</i>	13Hrs
Unit III	• Establish cell lines • Kinetics of cell growth • Hybridoma technology • Monoclonal antibodies • Transgenic animals – Mice ○ Retroviral method ○ Microinjection method ○ Embryonic stem cell method ○ Applications of transgenic animals	13Hrs
Unit IV	• Animal tissue culture ○ Explants ○ Culture media ○ Culture of animal tissues • Animal bioreactors ○ Selection and inoculation of micro-organisms ○ Preparation of animal ○ Product harvest ○ Application of animal bio-reactors ○ Nano- biotechnology	13Hrs
Unit V	• <i>Bacillus thuringensis</i> as a pesticide • Biofertilizer • Biosensors- Biochips • Biodegradable plastics • Biosafety ○ Possible dangers of GEO's ○ Implementation of biosafety guidelines • Bioethics ○ Monitoring the welfare of transgenic animals ○ Keeping of transgenic animals	13Hrs
Total Contact Hrs		65

- *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment,
Books for Study:

1. Kumarasan V. and Arumugam N (2017) *Animal Biotechnology* –Saras publications, 114/35G, A.R.P.Camp Road, Periyavilai, Kottar Post, Nagercoil – 629002 : Tamilnadu, India
2. Gupta, P.K (2004) *Elements of biotechnology* - Bistogi publications, Meerut

Books for Reference:

1. Ignacimuthu, S. (1995), *Basic Biotechnology*, Tata McGraw Hill Publishing Company Ltd, New Delhi.
2. Duhey, R. C. (1996) *A text book of Biotechnology*, Cambridge University Press
3. *Molecular Biology and Biotechnology* (1993) S.Chand & Company Ltd, New Delhi.
4. John, E.Smith, (1993) *Biotechnology*, Vikas Publishing House Pvt. Ltd, New Delhi
5. Balasubramanian, D. C.F. A. Bryce, Dharinalingam, K. J. Green, Kuntala Jayaraman (2005) *Concepts in Biotechnology*, University Press (India) Pvt. Ltd, Hyderabad
6. Jayanto Achrekar (2007) *Fermentation biotechnology*, Dominant Publishers, New Delhi
7. Sayyed and Palil (2009) *Biotechnology-emerging trends* Scientific publishers India
8. Kumarasan V. (2014) *Biotechnology* –Saras publications, 114/35G, A.R.P.Camp Road, Periyavilai, Kottar Post, Nagercoil – 629002 : Tamilnadu, India.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr.P.R.Balasubramanian	Dr.P.R.Balasubramanian	Dr.M.Durairaju	Dr.R.Muthukannan
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc	Programme Title :	Zoology
Course Code:	18U2Y509	Title	
		Biostatistics and Biophysics	
Hrs/Week:	5	Batch :	2018-2021
		Semester	V
		Credits:	4

Course Objective

- The basic knowledge about Biostatistics and Biophysics.

Course Outcomes (CO)

K1	CO1	To recollect the concepts of biostatistics and biophysics
K2	CO2	To understand the formula and principles used in biology.
K3	CO3	To apply different data used in biological samples.
K4	CO4	To analyse the importance about instruments in biological laboratory.

Unit	Content	Hrs
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Unit I	• Collection of data ➤ Methods of collection - Random and Non-random sampling ➤ Primary and Secondary data • Tabulation ➤ Parts of table ➤ Simple and complex table • Diagrammatic presentation ➤ Line diagram ➤ Bar diagram ➤ Pie diagram • Measures of central tendency ➤ Arithmetic mean ✓ Individual - Discrete and Continuous series ➤ Median ➤ Mode	13Hrs
Unit II	• Standard deviation ➤ Individual - Discrete and Continuous series ➤ Merits and demerits • Correlation ➤ Karl Pearson's coefficient of correlation ➤ Positive and negative correlation • Regression analysis ➤ Types and methods	13Hrs
Unit III	• Chi-square Test ➤ Degrees of freedom ➤ Null hypothesis • Student's T-test - Properties and Applications • Analysis of Variance (ANOVA) - One-way analysis	13Hrs
Unit IV	• Scope of biophysics • Thermodynamics principles ➤ First and second law • Bioluminescence ➤ Types ➤ Mechanisms ➤ Functions	13Hrs
Unit V	• Instrumentation ➤ Compound microscope ➤ Electron microscope - Transmission Electron Microscope (TEM) and Scanning Electron Microscope (SEM) ➤ Chromatography - Thin layer chromatography (TLC) ➤ Electrophoresis - Polyacrylamide Gel Electrophoresis (PAGE)	13Hrs
Total Contact Hrs		65

• *Italics denoted as self study topic.*

Assignment, PPT, Seminar

Books for Study:

1. Arumugam M. (2017), Basic concepts of Biostatistics - Saras publication 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PO, Nagercoil -629 002, Kanyakumari
2. Arumugam N. and Kumaresan V. (2016) Biophysics and Bioinstrumentation - Saras publication, 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Veer Bala Rastogi, (2009) 2nd edition, Fundamentals of biostatistics- Ane Books, Pvt. Ltd, New Delhi.
2. Rana, S. V. S. (2009) 2nd edition, Biotechniques – Theory and Practice, Rastogi Publication, Meerut.
3. P. K. Srivastava, (2005) 1st edition, Elementary Biophysics – Narosa Publishing House, New Delhi, 110 002.
4. Subramanian, M. A. (2005) 1st edition, Biophysics – Principles and Techniques- MJP Publishers, Chennai, 600 005.

Mapping

CO	PS0	PS01	PS02	PS03	PS04	PS05
	CO1	S	M	S	H	S
	CO2	H	M	H	H	M
	CO3	M	S	M	M	M
	CO4	M	H	M	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature Dr. M. Durairaju.	Verified by HOD Name and Signature Dr. P. R. Balasubramanian	Checked by CDC Dr. M. Durairaju	Approved by COE Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	18UZY510	Title Medical Laboratory Techniques (Core Elective - I)	Batch : 2018-2021
Hrs/Week:	4	Credits:	5

Course Objectives

- To understand the basic principles and applications of MLT,

Course Outcomes (CO)

K1	CO1	To remember the structure and function of medical laboratory instruments
K2	CO2	To understand the methods used in medical laboratory
K3	CO3	To apply knowledge about laboratory diagnosis
K4	CO4	To analyze and estimation of blood, urine, faeces, sputum and semen.

Unit	Content	Hrs
Unit I	• Introduction & Instruments ◊ Code of conduct for laboratory personnel ◊ Structure of a laboratory • Laboratory Instruments ◊ Centrifuge ◊ Autoclave ◊ ECG ◊ B. P. apparatus and stethoscope ◊ Automatic analyzer ◊ General procedure – cleaning -Sterilization and disposal of infected materials ◊ <i>Safety measures and first aid</i>	13Hrs
Unit II	• Haematology ◊ Blood collection ◊ Anticoagulant - Ammonium & Potassium oxalate mixture ◊ Bleeding time and clotting time ◊ Staining of blood films ◊ Estimation of haemoglobin ◊ Blood cell total count - RBC and WBC ◊ Erythrocyte Sedimentation Rate (ESR) ◊ Glucose Tolerance Test (GTT) ◊ Blood glucose ◊ <i>Anaemia- Iron deficiency anaemia</i>	13Hrs
Unit III	• Urine Analysis ◊ Collection & preservation of urine ◊ Physical examination ◊ Chemical examination ◊ Microscopic analysis • Faeces Analysis ◊ Collection & preservation ◊ Physical examination ◊ Microscopic examination	13Hrs
Unit IV	• Sputum Analysis ◊ Collection & preservation ◊ Naked eye inspection ◊ Microscopic examination ◊ Chemical examination • Semen Analysis ◊ Collection of semen ◊ Physical examination ◊ Microscopic analysis ◊ Preparation of smear and staining	13Hrs
Unit V	• Pregnancy test ◊ Immunologic methods ◊ Pregnancy card • Sexual Diseases ◊ Syphilis ◊ Venereal Disease • Clonal Bank ◊ Ova Bank ◊ Semen Bank ◊ Gene Bank	13Hrs

- *Italics denoted as self study topics*

- Assignment ,Seminar

Books for Study:

1. Sammel, K. M. (1982) Notes on Clinical Lab Techniques. K. Gopalan publishers, Madras
2. Ramnik Sood, M.L.T. (1999) 5th edition. Jaypee Brothers Medical publishers (P) Ltd. Delhi

Books for Reference:

1. Sachdev, K. N. (1991) Clinical pathology and bacteriology. Jaypee brothers- medical publishers, New Delhi
2. John Macleod and John Munro, (1988) Clinical Examination. ELBS publishers
3. Dutta, A. (2009) Experimental Biology A laboratory manual. Narosa Publishing House, New Delhi.

Mapping

CO	PS0	PS01	PS02	PS03	PS04	PS05
CO1		S	H	H	H	S
CO2		H	H	S	S	H
CO3		H	S	S	H	H
CO4		S	H	H	H	S

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. P. R. Balasubramanian	Dr. M. Durairaju	Dr. R. Muthukumar
Signature	Signature:	Signature:	Signature:

Programme code:	R, Sc	Programme Title :	Zoology	
Course Code:	180ZY511	Title	Batch :	2018-2021
		Bioinformatics and Information Security (Core Elective -II)	Semester	V
Hrs/Week:	3		Credits:	3

Course Objective

- To study the basic bioinformatics tools and it uses
- To know the recent development of information and network security

Course Outcomes (CO)

K1	CO1	To keep in mind the basic bioinformatic tools and its uses
K2	CO2	To comprehend the genomic study, phylogenetic analysis and sequence analysis

R3	CO3	To deploy the information and network security mindset.
R4	CO4	To interpret the common threats today in computer network.
Unit	Content	Hrs
Unit I	• Scope of Bioinformatics • Databases ➤ Biological database (Properties and classification) ➤ Specialized database • Protein sequence database – SWISS-PROT • Data mining • Virtual Library	(7Hrs)
Unit II	• Genomics – Definition, classification and applications • Proteomics – Definition, classification and applications • Drug designing • Human genome project ➤ Goals and techniques ➤ Potential benefits • <i>Bioinformatics tools and its uses</i>	(8Hrs)
Unit III	• Similarity tool : BLAST • Visualizing tool : RasMol • Miscellaneous tool : Webcutter • Phylogenetic analysis - Definition and applications • Construction of phylogenetic tree - structure of rooted tree	(8Hrs)
Unit IV	Information security • Components of Communications System – Transmission Media – Protocol definition – Introduction to TCP/IP – Wireless Network – Basics of Internet – Types of attack : Phishing, Spoofing, Impersonation, Dumpster diving – Information Security goals – Information Security Threats and Vulnerability: Spoofing Identity, Tampering with data, Repudiation, Information disclosure, Denial of service, Elevation of Privilege.	(8Hrs)
Unit V	Authentication - Password Management - E-Commerce security - Windows security - Network Security: Network Intrusion detection and prevention systems - Firewalls - Software Security - Web security: User authentication, authentication-secret and session management, Cross site scripting, Cross site forgery, SQL Injection, Computer Forensics - Steganography	(8Hrs)
Total Contact Hrs		39

- *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Case study

Books for Study:

1. Ron Mansfield, (2009) *Working in Microsoft office*- McGraw-Hill Book Co, New York
2. Sundaralingam R & Kumaresan V. (2012) *2nd edition Bioinformatics*, Saras Publication, 114/35G - A.R.P Camp road, Periyavillai, Kortar PO, Nagercoil, Kanyakumari.

Books for References:

1. Rajaraman, V. (1986) *Fundamentals of computer* - Prentice Hall of India Pvt Ltd, New Delhi - 110001

2. Simminder Kaur Thukral. (2007) Bioinformatics-Orpita Bosa, Oxford University Press, New Delhi 110001
3. Attwood T.K. and Parrysmith D.J. (1999) Introduction to Bioinformatics- Addison Wesley Longman, Harlow.
4. Fuelker, MJH (2009) Bioinformatics – Applications in Life and Environmental Sciences Capital Publishing Company, New Delhi.
5. Ignacimuthu, S. (2005) Basic Bioinformatics – Narosa Publishing House, New Delhi.
6. Sharma, Munjal & Shankar (2008) A text book of Bioinformatics –, Rastogi Publications, Meerut, India;
7. Jin Xiong, (2006) Essential Bioinformatics Cambridge University Press
8. Subramanian C. (2010) Genomic Bioinformatics- Dominant Publisher, New Delhi

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	H
CO2	H	M	H	H	H
CO3	M	H	H	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by CDE/Co
Ms. S. Mariselvi	Dr. P. R. Balasubramanian	Dr. M. Daciraju	Dr. R. Muthukumar
Signature:	Signature:	Signature:	Signature:

Programme code: B.Sc	Programme Title : Zoology
Course Code: 18UZY617	Title: MAJOR PRACTICAL-III (Developmental biology & Endocrinology, Biostatistics & Biophysics, Animal Physiology & Biochemistry and Medical Laboratory Technique)
Batch : 2018-2021	Semester : V & VI
Hrs/Week: 2	Credits: 4

Course Objectives

- To study the practical knowledge about the Developmental Biology & Endocrinology, Biostatistics & Biophysics, Biochemistry & Animal Physiology & MLT.

Course Outcomes (CO)(for Practicals Only)

K3	CO1	To recollect the importance of laboratory test
K4	CO2	To understand the normal level of human samples
K5	CO3	To apply the instruments used in biological experiment.

Content	
EXPERIMENTS	
• Qualitative detection of Excretory products • Total count of RBC • Total count of WBC • Estimation of haemoglobin • Preparation of Blood smear • Bleeding and clotting time • Preparation of haemin crystals • Find the mean and Standard deviation of the given samples	
SPOTTERS	
Developmental Biology& Endocrinology (structure/developments)	
• Frog- Egg • Frog- Cleavage • Frog- Yolk plug • Chick- Egg • Chick embryo - 24 hours • Chick embryo - 72 hours • Chick embryo - 96 hours • T. S. of Thyroid gland • T. S. of Ovary • T. S. of Testis	
Biochemistry & Animal physiology (structure and function)	
• Structure of haemoglobin • Structure of pentose • Structure of sucrose • Structure of starch • Structure of cholesterol • Mammalian Ear • Mammalian Heart • Mammalian Kidney	
Biostatistics and Biophysics (statistical importance)	
• Multiple bar diagram • Pie diagram • Frequency polygon • Compound microscope • Electron microscope (TEM) • Thin Layer Chromatography (TLC) • Electrophoresis - PAGE • pH meter	
Medical Laboratory Technique (MLT) - (structure, principle and uses)	
• Haemocytometer • Sahli's haemometer • Albuminometer • BP apparatus • Urinometer • Ultra Centrifuge • Autoclave	

- UV Spectrophotometer

Total Contact Hrs

52

Books for Reference:

1. Arumugam, N. (2017) Developmental Zoology - Saras Publication, 114/356, A.R.P Camp Road, Periyavilai, Kottar Post, Nagercoil - 629002, Tamilnadu, India, 2011
2. H. R. Singh and Neerajkumar, 2014. Animal Physiology and biochemistry, Vishal Publishing Co. Jalandhar, Delhi
3. Rannik Sood, Medical Laboratory Techniques (MLT). (1999) 5th edn. Jaypee Brothers Medical publishers (P) Ltd. Delhi
4. Mariakuttikan, A. and Arumugam, N. 2014. Animal Physiology - Saras publication, Nagercoil, Kanyakumari Dist. Tamil Nadu.

Mapping

PSQ CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	H	S	H
CO2	M	H	M	H	M
CO3	S	H	H	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. M. Durairaju	Dr. P. R. Balasubramanian	Dr. M. Durairaju	Dr. R. Muthukumar
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	18UZY618	Title	Batch :	2018-2021
		MAJOR ZOOLOGY PRACTICAL – IV (Ecology, Evolution, Biotechnology, Microbiology, Sericulture and Aquaculture)	Semester	V & VI
Hrs/Week:	2		Credits:	4

Course Objective

- To obtain practical knowledge in ecology, evolution, biotechnology, microbiology, sericulture, aquaculture.
- To study the physico-chemical nature of environment

Course Outcomes (CO)

K3	CD1	To recollect the knowledge on Ecology, Evolution, Biotechnology, Microbiology, Sericulture and Aquaculture
K4	CD2	To understand the estimation of different water quality parameters, microbial culture and morphometric measurement of fish.
K5	CD3	To access the micro environment and report preparation.

Content	
EXPERIMENTS	
• Estimation of dissolved oxygen in water samples. • Estimation of carbondioxide • Determination of primary productivity • Estimation of salinity in water samples • Determination of pH in water samples • Culture medium preparation (Demonstration only) • Milk Methylene Blue Test • Hanging drop preparation • Morphology and morphometric measurements of fish by using model • Water quality analyzer (Demonstration only)	
SPOTTERS	
Ecology and Evolution	
• Sacculina on Crab • Albunea • Hippa • Anguilla • Coccys • Fossil • Peppered moth • Vermiform appendix	
Biotechnology/ Microbiology	
• E-Coli • Plasmids • Biodiesel Plant – Jatropha • PCR • Micropipette • Magnetic stirrer • Laminar Air Flow • Gel Electrophoresis	
Sericulture	
• Silkworm • Cocoon • Mulberry shoot • Mulberry leaf • Netrika/chanārika • Leaf Mosaic disease • Leaf Blight disease	
Aquaculture	
• Common Carp • Gill net • Hook • Fish parasite – Argulus • Chinese dip net • Edible Oyster • Pearl oyster – <i>Pinctada vulgaris</i>	

Total Contact Hrs		52		
Mark Distribution:				
Total Marks	Internal (CIA)	Marks	End of semester Practical Examination (ESE)	Marks
100	Practical	10	Experiments	20
	Skill/observation		Spotters	20
	Model Practical Examination	20	Field visit /Micro-environmental study/ report preparation	10
	Record work	10	Record	10
	Total Marks	40	Total Marks	60
Hands on experience in practicals. Activity.				

Books for Reference:

1. Ganga, G and Subashana chetty, (1999). An introduction to sericulture. Oxford and BH publishing company Pvt. Ltd. New Delhi
2. Jayasurya, (2016). Economic Zoology. Saras publication. Nagercoil, Kanyakumari Dist. Tamil Nadu
3. Kumareshan, V (2016) Biotechnology. Saras publication. Nagercoil, Kanyakumari Dist. Tamil Nadu.
4. Odum, E. P (1971) Fundamentals of ecology W.B. Sanders Company, London
5. Arumugam, N. (2016) Aquaculture SARAS Publications, Nagercoil, Tamilnadu
6. ICAR Publication (2006) 1st edition. Hand book of fisheries and aquaculture, Directorate of information and publications of agriculture, Indian Council of Agricultural Research, New Delhi

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	M	H	H	H
CO3	M	S	H	M	M

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature Dr.P.R.Balasubramanian		Verified by HOD Name and Signature Dr.P.R.Balasubramanian		Checked by CDC Dr.M.Duraiya		Approved by COE Dr.R.Muthukumaran	
Signature:		Signature:		Signature:		Signature:	
Programme code:	B.Sc	Programme Title :			Zoology		
Course Code:	18UZY5S1	Title Apiculture (SRF)			Batch :	2018-2021	
					Semester	V	
Hrs/Week:	1				Credits:	2	

Course Objective

- To examine the scope of beekeeping in India and other countries
- To identify major bee keeping challenges and opportunities.
- Purchase of honey, wax and byproducts from bee keeping industry

Course Outcomes (CO)

CO1	To remember the steps involved in modern beekeeping techniques and its practical
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		difficulties
K2	CO2	To comprehend methodologies involved in bee keeping
K3	CO3	To apply modern tools in bee keeping and value added product preparation
K4	CO4	To validate different bee keeping techniques and its byproducts

Unit	Content	Hrs
Unit- I	Scope of Apiculture Classification of honey bee Types of honey bee – <i>Apis dorsata</i> - <i>Apis indica</i> – <i>Apis florea</i> - <i>Apis mellifera</i> Biology of honey bee – External Structure of worker bee Life cycle of honey bee	3Hrs
Unit- II	<i>Social organization of honey bee colony -Queen - Drones and Worker</i> Structure of Beehive Food of Honeybees Modern bee hive – Langstroth hive - Newton's hive	3Hrs
Unit- III	Bee keeping equipments Extraction of honey Honey – Properties – Chemical composition – <i>Value of honey (Nutritional, Medicinal values)</i>	2Hrs
Unit- IV	Royal jelly – Composition and functions Bee wax – Production - Characteristics and uses Beeswax – Characteristics and uses	2Hrs
Unit- V	Diseases of honey bee – Bacterial disease – Viral disease – Acarine disease – Queen rearing – Procedure- Hopkins method- Miller method and Doolittle method	3Hrs
Total Contact Hrs		13

• *Italics denoted as self study topics*

Power point Presentations, Seminar , Assignment, Discussion

Books for Study

- Arumugam N. (2017) Applied Zoology, Saras Publication, 114/35 G. A.R.P Camp Road, Peravillai, Kottar PO, Nagercoil -629 002, Kanyakumari.

Books for References

- Bhamrab Kavita Juneja H.S. (2001) 2nd edition, An Introduction to Arthropoda-, Animal Publications Pvt. Ltd., New Delhi.
- Shukla Upadhyay (2003): Economic Zoology – Rastogi Publications, Shivaji Road, Meerut-250002, India.
- Dharam Singh & Sevensder Pratap Singh, (2006) edition, A handbook of Bee Keeping –Agrobios (India), Jodhpur,
- Rajendra Singh & Sachan G.C. (2010) 1st edition, Elements of Entomology, , Rastogi Publications, Meerut,
- Bee keeping basics, MAAREC: Delavane, Maryland, New Jersey, Pennsylvania, West Virginia & the USDA Co-operating PENNSTATE 1855- E-book

Mapping

CO \ PSO	PS01	PS02	PS03	PS04	PS05
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Somasundaram	Dr. P. R. Balasubramanian	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	18UZY5S2	Title	Batch : 2018-2021
Hrs/Week:	1	Insect Pest Management(SBE)	Semester IV
			Credits: 2

Course Objectives

- To study the insect available in the agricultural field

Course Outcomes (CO)

K1	CO1	To remember agricultural pest and their management
K2	CO2	To understand the control of pest management
K3	CO3	To apply modern methods in agricultural field
K4	CO4	To interpret application of pesticide

Unit	Content	Hrs
Unit I	Pest definition - Definition - Classification Reasons for insect pest Insect pest out break Injuries and Damage caused by insect pest	3Hrs
Unit II	Assessment of insect pest population Assessment of insect pest damage Pest surveillance and forecasting pest outbreak Need for insect pest management	3Hrs
Unit III	Pest control Climatic factors Natural enemies Physical Mechanical <i>Cultural - biological and legal control</i>	2Hrs
Unit IV	Insecticide- Definition - Formulation of insecticides Classification based on modern entry Classification based on modern action Brief account of Attractants- Antifeedants and Chemosterilants. <i>Integrated Pest Management</i>	2Hrs
Unit V	(Major Local Agricultural pest and their Management) Cotton - The cotton Boll worm - <i>Helicoverpa armigera</i> Coconut - The Rhinoceros beetle - <i>Oryctes rhinoceros</i> Groundnut - The Red hairy caterpillar - <i>Amsacta albistriga</i> Sugarcane - The sugarcane stem borer- <i>Chilo infuscatellus</i>	2Hrs
Total Contact Hrs		13

- *Italics denoted as self study topics*

Assignment, Seminar

Books for Reference:

1. Shukla, Upadhyay (2003). Economic Zoology -, Rastogi Publications, Shivaji Road, Meerut- India 250002

Mapping

CU	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	H	H	H	H	S
	CO2	S	M	H	H	H
	CO3	S	S	S	M	M
	CO4	H	H	H	M	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. P. R. Balasubramanian	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	18 UZY 612	Title	Batch : 2018-2021
		Animal Physiology and Biochemistry	Semester VI
Hrs/Week:	5		Credits: 5

Course Objective

- The complete understanding of all the chemical process associated with living cell
- To study the basis for various organ systems in the animal kingdom

Course Outcomes (CO)

K1	CO1	To remember the bio chemical and physiological structure and activity of individual cell level
K2	CO2	To comprehend physiological activity of organ system and bio chemical activity of cells
K3	CO3	To apply functional knowledge on various organs and its status
K4	CO4	To sort of animal is physiology and bio chemistry

Unit	Content	Hrs
Unit- I	Respiration: - Aerobic & Anaerobic respiration - Respiratory pigments in animals - Transport of gases - O₂ and CO₂ Circulation: - Myogenic & Neurogenic heart - Pacemaker and electrical activity of heart in man - Composition and functions of blood - Composition and functions of Lymph Excretion: <i>Structure of mammalian kidney</i> - Structure of Nephron - Synthesis of ammonia - urea and uric acid - Formation of urine in Human	13Hrs
Unit- II	Water Balance: - Osmotic and ionic regulations in aquatic animal (Fish) Receptors: - Chemoreceptors - Gustatoreceptors & Olfactoreceptors - Photoreceptor (Eye) - Phonoreceptor (Ear) Effectors: - Types of muscles : Striped- unstriped and cardiac muscles - Structure and properties of striped muscle - Mechanism of muscular contraction- sliding filament theory	13Hrs
Unit- III	Nervous system: - Structure of vertebrate neuron - Conduction of nerve impulse through : Non-myelinated neuron Synapse - Neuromuscular junction - Reflex action and reflex arc Reproductive system: - Sexual cycle in human: Puberty - Spermatation - Ovulation - Menstrual cycle - Pregnancy and Parturition.	13Hrs
Unit- IV	Classification of Carbohydrates: - Monosaccharides - Pentoses- Hexoses - Disaccharides - Non-reducing sugar C1 - C1-Sucrose Reducing Sugar C1 - C4 -Lactose - Polysaccharides - Homopolysaccharide - Starch Heteropolysaccharide - Heparin Classification of Lipids:	13Hrs

	➤ Simple lipids - Fats and Waxes ➤ Compound lipids - Phospholipids- Glycolipids ➤ Derived lipids - Glycerol - Fatty acids and Cholesterol • Classification of Proteins: ➤ Based on structure - Simple - Conjugated- Derived ➤ Based on solubility- Globular- Fibrous	
Unit- V	• Metabolism: ➤ Metabolism of carbohydrates: Glycolysis- Glycogenesis- Kreb's cycle & Glycogenolysis ➤ Metabolism of lipids :β-oxidation of fatty acids ➤ Metabolism of proteins :Transamination- Deamination ➤ <i>Vitamin: Water soluble & Fat soluble</i>	13Hrs
Total Contact Hrs		65

- *Italics denoted as self study topics*

Power point Presentations, Seminar , Assignment, Discussion, Activity, Case study

Books for Study:

1. Thulasi Fatima, (2017) Biochemistry - Saras Publication, 114/35G, A.R.P Camp Road, Periyavilal, Kottiar Post, Nagercoil - 629002, Tamil nadu, India
2. Arumugam N, (2017) Animal physiology- Saras Publication, 114/35G, A.R.P Camp Road, Periyavilal, Kottiar Post, Nagercoil - 629002, Tamil nadu, India

Books for Reference:

1. Parameswaran, Ananthakrishnan & Ananthasubramanian, (1991) Outline of animal physiology - S. Viswanathan printers & Publishers Pvt. Ltd.
2. Verma, P. S., Tyagi and Agarwal, (1997) Animal physiology - Chand & company Ltd
3. S. Sree Kumar, (2010) Basic Physiology - PHI Learning Pvt. Ltd, New Delhi, 110001, Edition.
4. Berry, A.R. A text book of Animal Physiology - EMKAY Publication, New Delhi-110051
5. Rastogi, S. C. (1995) Biochemistry - Tata McGraw-Hill Education.
6. Sathyanarayana U & Chakrapani, U. (2009) 2nd Edition, Essential of Biochemistry - Books & Allied pvt ltd 83/1, Beliaghata main road, Kolkata 700010, India

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	S	H
CO3	M	S	S	M	M
CO4	M	H	H	L	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. S. Somasundaram Signature:	Dr. P. R. Balasubramanian Signature:	Dr.M.Durairaju Signature:	Dr.R.Muthukumaran Signature:
Programme code:	B. Sc	Programme Title :	Zoology
Course Code:	18UZY613	Title	Batch : 2018-2021
		Ecology and Evolution	Semester VI
Hrs/Week:	5		Credits: 4

Course Objective

- Knowledge about the basic concepts of Ecology and Evolution

Course Outcomes (CO)

Course Outcomes (CO)		
K1	CO1	To recollect the importance of abiotic factors and origin of life
K2	CO2	To understand the basic concepts of animal relationship and fossils
K3	CO3	To apply knowledge about animal ethics and evidences of evolution
K4	CO4	To analyze the animal population and organic evolution of man
Unit	Content	Hrs

Unit I	• Scope of ecology • Abiotic factors ➤ Soil: Pedogenesis - Soil texture- Soil profile – Soil fauna. ➤ <i>Water: Properties of water</i> ➤ Temperature: Range of temperature- Thermal stratification- biological effects of temperature ➤ Light: light on water – biological effects of light	(13Hrs)
Unit II	• Biogeochemical cycle ➤ Gaseous cycle - Carbon cycle- Nitrogen cycle ➤ Sedimentary cycle: Sulphur cycle- Phosphorus cycle • Animal relationship ➤ Commensalism ➤ Mutualism ➤ Parasitism • Animal population ➤ Characteristics of population - Natality- mortality-growth density • Animal Ethics ➤ Animal rights ➤ Animal law ➤ Wild life conservation	(13Hrs)
Unit III	• Biochemical origin of life • <i>Orey and Miller's experiment</i> • Geological time scale • Fossils: Types and Dating of fossils	(13Hrs)
Unit IV	• Evidences of evolution ➤ Morphological: Homologous structures – vestigial organs – connecting links ➤ Embryological: Recapitulation theory ➤ Palaeontological: Missing links	(13Hrs)
Unit V	• Darwinism : Over production – variation – survival of the fittest – struggle for existence – origin of species • Isolating mechanism ➤ Geographic isolation ➤ Reproductive isolation • Organic evolution of man	(13Hrs)
Total Contact Hrs		65

• *Italics denoted as self study topics*

Assignment, Seminar, PPT, Case study

Books for Study:

1. Arumugam N. (2017) Concepts of ecology. Saras publication 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PD, Nagercoil -629 002, Kanyakumari
2. Arumugam N. (2015) Organic Evolution – Saras publication 114/35 G, A.R.P Camp Road, Periyavillai, Kottar PD, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Odum E. P. (1971) 1st edition, Fundamentals of ecology. W. B. Saunders Company, London.
2. Verma and Agarwal. (2003) 5th edition, Principles of Ecology. S. Chand & Company, Ltd. New Delhi, 110055

- Tomar and Singh, (2010) 8th edition, Evolutionary Biology - Rastogi Publication, Meerut, 250 002
- Saha, T. K. (2002) 1st edition, Life: Origin, evolution and adaptation. Books and allied (P) Ltd. Kolkata - 700 010

Mapping

CO	PS0	PS01	PS02	PS03	PS04	PS05
	CO1	S	H	M	M	S
	CO2	H	S	H	M	H
	CO3	H	M	M	H	M
	CO4	M	M	H	M	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr. M. Durairaju	Dr. P. R. Balasubramanian	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc	Programme Title :	Zoology
Course Code:	18UZY614	Title	Batch : 2018-2021
Hrs/Week:	5	Microbiology and Immunology	Semester VI
			Credits: 4

Course Objectives

- To acquire a basic knowledge of microbiology and immunology

Course Outcomes (CO)

K1	CO1	To keep in mind the scope of microbiology and immunology
K2	CO2	To understand the classification of microorganisms and immunity
K3	CO3	To apply the knowledge about food microbiology, Agricultural microbiology, Medical microbiology

Unit	Content	Hrs
Unit I	• Introduction and scope of microbiology • Classification of microorganisms • Basic methods in Microbiology • Staining procedure and types of staining	13Hrs
Unit II	• Bacteria: ◊ Major features and structure of bacteria ◊ Economic importance of bacteria ◊ Bacterial growth and Growth curve ◊ Bacterial culture – Culture of <i>E.Coli</i> • Viruses: ◊ Characteristic and structure of viruses ◊ classification of virus	13Hrs
Unit III	• Applied microbiology ◊ Agricultural microbiology: • Role of microorganism in soil fertility • Biofertilizers • Harmful role of microorganism ◊ Food microbiology: • Microorganisms of food • Factors influence microbial growth • Food spoilage- Food preservation ◊ Medical microbiology • Normal microflora of human body • Bacterial Diseases -Boutillism, Cholera • Viral Diseases – Measles, Viral hepatitis	13Hrs
Unit IV	• Immunology ◊ Introduction and scope of immunology ◊ Classification of immunity – Innate and Acquired ◊ Lymphoid Organs ◊ Cells of the immune system – T and B Cells	13Hrs
Unit V	• Structure and classes of immunoglobulins • Classification of Major Histocompatibility Complex- (MHC) • Tumour immunology ◊ Properties of tumour cells ◊ Immune diagnosis and immunotherapy of tumour	13Hrs
Total contact Hrs		65

• *Italic denoted as self study topics*

Assignment, Seminar, Power point

Books for Study:

1. Mani, A., Selvaraj, A.M., Narayanan, I. M and Arumugam, N. (2007) Microbiology. Saras publications. 114/35 G. A.R.P Camp Road, Perivillai, Kottar PO, Nagercoil -629 002, Kanyakumari.
2. Dulay Fatima and N. Arumugam, Immunology. (2001) Saras Publications. 114/35 G. A.R.P Camp Road, Perivillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Books for Reference:

1. Dubey R. C. and Maheswari, D.K. (2006) A Text book of Microbiology, Cambridge University Press.
2. Ignacimuthu, S. (1995) Basic Biotechnology –Tata McGraw Hill Publishing Company Ltd, New Delhi.
3. Dubey, R. C. (1996) A text book of Biotechnology –Cambridge University Press
4. John.E.Smith, (1993) Biotechnology –, Vikas Publishing House Pvt. Ltd, New Delhi.
5. Gupta, P. K. (2004) Elements of biotechnology –Rastogi Publications, Meerut

Mapping:

CO	PSO	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	S	S	H	H	S
	CO2	H	H	S	S	H
	CO3	S	S	S	H	S
	CO4	H	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi	Dr. P. R. Balasubramanian	Dr. M. Durairaju	Dr. R. Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc.	Programme Title :	Zoology
Course Code:	18UZY615	Title	Batch : 2018-2021
		Sericulture	Semester VI
Hrs/Week:	4		Credits: 3

Course Objective

- To study the culture of mulberry plantation and rearing of silkworm

Course Outcomes (CO)

K1	CO1	To remember the historical background of Sericulture and importance of agricultural production.
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K2	CO2	To get the idea for increasing cocoon productivity and to prevent silkworm diseases
K3	CO3	To execute the construction of rearing house and self employment in silkworm rearing
K4	CO4	To analyze this course for employment and job opportunities in the public, private and Govt. sectors.

Syllabus

Unit	Content	Hrs
Unit I	- Definition and History of Sericulture - Economic importance of sericulture - Varieties of silkworms: - Mulberry silk worm: <i>Bombyx mori</i> - Non- Mulberry silk worm: <i>Tasar</i> - Muga and Eri silkworms - Uses of silk - Central and state silk board - Functions - Muriculture: Optimum conditions for mulberry growth - Planting direction and season - Planting systems	10 Hrs
Unit II	- Methods of vegetative Propagation ✦ Cutting ✦ Layering ✦ Grafting - Pruning: Low cut-High cut and Rejuvenation pruning - Methods of Leaf Harvesting - Preservation of leaves - Diseases of Mulberry: Fusarium Root Rot - Powdery Mildew - Leaf Blight - Leaf Mosaic disease	11 Hrs
Unit III	- Life cycle of <i>Bombyx mori</i> - Structure of silk worm - Structure of Silk gland - Spinages - Incubation and Brushing - Silkworm rearing appliances	10 Hrs
Unit IV	- Disinfection - Rearing of mature larvae: Shelf- Floor and shoot rearing - Characteristics features of ripeworms - Mounting: Methods and precaution during mounting - Diseases of silk worms: ✦ Pebrine ✦ Viral Flacherie (IPV) ✦ Grasserie- Nuclear Polyhedrosis (NPV) - Indian Uzi Fly (Pest of silkworm)	11 Hrs
Unit V	- Physical characteristics of cocoons - Defective cocoons - Reeling appliance - Country Charkha - Cocoon Markets - Raw silk testing	10 Hrs
Total Contact Hrs		52

- * Italics denoted as self study topics

Power point Presentations, Seminar, Assignment

Books for Study:

1. Ganga G. and Sulochana Chetty, J. (2008) An introduction to sericulture – Oxford and IBH Publishing Co. PVT. LTD.

Books for Reference:

1. Ullal and Narasimhan, M.N. 2nd Ed. Hand Book of practical sericulture –SBS Publishers, Bangalore
2. Manual on sericulture – FAO, Central Silk Board Bangalore.
3. Ezhili N. & Thirumathal K. (2008) A hand book for sericulture –, Shrishti Impression, Coimbatore

Mapping:

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	H
CO2	H	M	H	H	H
CO3	M	H	S	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature		Verified by HOD Name and Signature		Checked by CDC		Approved by COE	
Ms. S. Mariselvi		Dr. P. R. Balasubramanian		Dr.M.Duraiaraju		R.Muthukumaran	
Signature:		Signature:		Signature:		Signature:	
Programme code:		B.Sc	Programme Title :			Zoology	
Course Code:		18UZY616	Title Aquaculture (Core Elective –III)			Batch :	2018-2021
Hrs/Week:		5				Semester	VI
						Credits:	5

Course Objective

- To study the nature and habitat of different aquatic animals

Course Outcomes (CO)

K1	CO1	To keep in mind the environmental assessment strategies and management systems.
K2	CO2	To deduce the techniques involved in the culture of various organisms

K3	CO3	To apply the knowledge in food sectors, hatchery and nursery operations
K4	CO4	To sort of the structure and functions of aquatic ecosystems

Unit	Content	Hrs
Unit I	• Scope of aquaculture • <i>Aquaculture in India</i> • General character and adaptations in fishes • General Organisation of fish ➤ Teleost – <i>Labeo rohita</i> ➤ Morphology and anatomy ▪ Digestive system ▪ Circulatory system ▪ Reproductive system • Pond culture- different kinds of fish ponds in a model fish farm.	12hrs
Unit II	• Culture methods ➤ mono culture ➤ poly culture ➤ integrated culture • Brackish water culture • Fresh water culture • Marine culture • Age and growth study • Induced spawning • Fish feed ➤ Classification of feed ➤ Composition of feed ➤ Live feed	10hrs
Unit III	• Bionomics of some important aquatic animals • Fresh water fishes ▪ Indian major carps- Catla Mrigal Rohu ▪ Exotic fishes- Common carp - Tilapia • Marine fish- Oil Sardine • Estuarine fish- Mullet • Prawn culture • Oyster culture • Pearl culture	10hrs
Unit IV	• Fish crafts – different types of fishing boats. • Gears ➤ Hooks ➤ Simple dipnets ➤ Chinese dipnets ➤ Gill nets ➤ Purse seine ➤ Trawl nets • Fish processing ➤ Identification of good and spoiled fish ➤ Refrigeration ➤ Freeze drying ➤ Fumigation ➤ Canning ➤ Salting	10hrs

Unit V	• Ornamental fish culture ➤ Requirements and setting of an aquarium ➤ Aquarium fishes • Fish pathology and major diseases ➤ Bacterial diseases ➤ Viral diseases ➤ Fungal diseases ➤ Fish parasites • Principles of harvesting- transport and marketing • By-products of fishes • Role of fishes in mosquito control • Transgenic fishes	10hrs
Total Contact Hrs		52

- *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Case study

Books for Study:

1. Arumugam, N. (2017) Aquaculture S&RAS Publications, Nagercoil, Tamilnadu.
2. Shanmugham, K. (1992) Fishery biology and aquaculture, T.E.O Pathippagam, Madras.

Books for Reference:

1. Vadepalli and Satyanarayana, (1996) Fish culture, Narendra publishing house, Delhi.
2. Datta Munshi and Srivastava, (1988) Natural history of fishes and systematic of Fresh-water fishes of India, Narendra Publishing House, New Delhi.
3. Jordan E. L. and Verma, P. S. (2000) Chordate Zoology, S. Chand and company LTD, New Delhi
4. Agarwal, S. C. (1994) A hand book on fish farming, Narendra publishing house, Delhi
5. Pandey and Shukla, (2010) Fish and fisheries, Rastogi publication
6. Charles I. Cutting, (1999) Fish processing and preservation, Agrobotanical publishers (India)
7. ICAR Publication (2006) 1st edition, Hand book of fisheries and aquaculture, Directorate of information and publicatio of agriculture, Indian Council of Agricultural Research, New Delhi
8. Jhingran, V.G. 1988. Fish and Fisheries of India - Hindustan Publishing Corporation India Delhi. Printed in India at Gopsons paper Pvt. Ltd. Noida.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	H
CO2	H	M	H	S	H
CO3	M	H	S	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr.P.R.Balasubramanian Signature:	Dr.P.R.Balasubramanian Signature:	Dr.M.Duraiaraju Signature:	Dr.R.Muthukumaran Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	18UZY6S3	Title	Batch :	2018-2021
		Vermiculture (SBE)	Semester	VI
Hrs/Week:	1		Credits:	2

Course Objective

- To study the importance of vermiculture

Course Outcomes (CO)

K1	CO1	To remember the role of worm farming in Modern Farming.
K2	CO2	To understand Economic importance of vermiculture
K3	CO3	To deploy Role of Vermiculture in protecting the environment and managing the waste
K4	CO4	To analyze the potential of vermicompost as an alternative to chemical fertilizers

Unit	Content	Hrs
Unit I	Systematic position of Earthworm – Habit and Habitat Commercial varieties of Earthworm for Vermicomposting. <i>Economic importance of vermiculture</i>	(3Hrs)
Unit II	Type study: Earthworm: Megascotex sp. External character – Digestive system Respiratory system Excretory system Reproductive system	(3Hrs)
Unit III	Life cycle of Earthworm Diseases and Predators of Earthworm Control measures	(2Hrs)
Unit IV	Types of soil Biomass Biodegradable wastes Nutrient content of Soil and Biomass	(2Hrs)
Unit V	Preparation of Vermibed Maintenance of Composting pit Collection of vermicompost Nutrient value of vermicompost Vermiwash Marketing of vermicompost	(3Hrs)
Total Contact Hrs		13

- *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Case study

Books for Reference:

1. Ekambaranatha Iyer, (1990) A Manual of Zoology, Part I & II, Invertebrata, Revised edition, S. Viswanathan(Printers and Publishers)
2. Odum, E. P (1971) Fundamentals of ecology W.B. Sanders Company, London
3. Gupta, P. K, (2005) Vermicomposting for sustainable agriculture. Agruhos, Jodhpur, India
4. Rana, S. V. S, (2010) Environmental biotechnology Rastogi Publication, Meerut, India
5. Arvind Kumar, (2005) Verms and vermotechnology APH Publishing co-operation.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	S	M	H	S
CO2	H	M	H	H	H
CO3	M	H	H	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Dr.P.R.Balasubramanian	Dr.P.R.Balasubramanian	Dr.M.Duraiaraju	Dr.R.Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	1BUZY654	Title	Batch :	2018-2021
		Poultry Science And Management Technology (SBE)	Semester	VI
Hrs/Week:	1		Credits:	2

Course Objective

- To know the basic concept of poultry science

Course Outcomes (CO)

K1	CO1	To keep in mind the role of poultry science
K2	CO2	To get the idea on poultry house and management.
K3	CO3	To execute feed formulation for broiler, layer and breeders.
K4	CO4	To evaluate the nutritive value of poultry meat and egg. To analyze the transport and marketing.

Unit	Content	Hrs
Unit I	- Importance and role of the poultry in rural development and employment potential. - Anatomy and physiology of poultry birds (hen) with reference to digestive and reproductive systems.	3Hrs
Unit II	- Poultry house and equipment - Space requirements - Types of houses <i>Summer management - Winter management</i> - Sterilization of room	3Hrs
Unit III	- Classification of feed stuffs - Availability of raw materials and their cost - Feed formulation and Feeding programme - Equipment for feeding and drinking.	2Hrs
Unit IV	- Management of broilers - Management of layers - Management of Breeders - Common diseases - Bird flu disease - Antibiotics - Vaccination and deworming - Insecticide treatment and Bio-remedies	3Hrs
Unit V	<i>Nutritive value of poultry meat and egg</i> - Grading and Preservation of eggs. - Packing and Transport and Marketing - Different uses of eggs - Poultry manure.	2Hrs
Total Contact Hrs		13

- Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Case study

Books for Reference:

1. Rice. E.J and Botosford. H. E. Practical poultry management . John Wiley, Hansen Inc. N.Y.
2. Gnanmani. J . Profitable poultry product ; Pyton publ. Co. Madurai, Tamilnadu
3. Siddiqui. H.M Manual of poultry production Practicals : College of Veterinary Science, Andrapradesh.
4. Shukla. Upadhyay (2003). Economic Zoology -Rastogi Publications, Shivaji Road, Meerut- India

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	M	H	H	H
CO3	M	S	S	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

Course Designed by Name and Signature	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Dr.P.R.Balasubramanian	Dr.P.R.Balasubramanian	Dr.M.Durairaju	Dr.R.Muthukumaran
Signature:	Signature:	Signature:	Signature:

Programme code:	B.Sc.	Programme Title :	Zoology	
Course Code:	18EVS201	Title	Batch :	2018-2021
		Environmental Studies	Semester	II
Hrs/Week:	2		Credits:	2

Course Objective

- To know the basic concepts of Environment

Course Outcomes (CO)

K1	CO1	To create an awareness about the Environment
K2	CO2	To get the idea on Environment conservation and management.
K3	CO3	To execute the pollution free environment in future perspectives.
K4	CO4	To evaluate the value of Natural Resources.

Unit	Content	Hrs
Unit I	1. The Multidisciplinary nature of Environmental Studies: - Introduction - Scope of Environmental Studies - Need for Public Awareness 2. Natural Resources - Types of Natural Resources - Natural resources and associated problems a. Forest resources b. Water resources c. Mineral resources d. Food resources e. <i>Energy resources*</i> - Role of an individual in conservation of natural resources - case studies	5Hrs
Unit II	3. Ecosystems: - Concept of an ecosystem - Structure and function of an ecosystem - Energy flow in the ecosystem - Ecological succession - Structure and functions of a) Aquatic ecosystems b) Terrestrial ecosystems 4. Biodiversity and its conservation: - Introduction - Genetic diversion - Species diversion - Value of Biodiversity - Hot - Spots of Biodiversity - Threats to biodiversity - Endangered and Endemic Species of India - Conservation of biodiversity	5Hrs
Unit III	5. Environmental Pollution: - Cause, effects and control measures of a. Air Pollution b. Water pollution	6Hrs

	c. Soil pollution d. Noise pollution * e. Thermal pollution f. Radioactive pollution • Pollution case studies	
	6. Solid waste management: • Causes, effects and control measures • Role of individual in prevention of pollution	
Unit IV	7. Disaster management: Floods, Earthquake, Cyclone and Landslides 8. Social issues and environment: • Sustainable Development • Urban problems related to energy • Rainwater harvesting * • Environmental Ethics • Global warming	5Hrs
Unit V	9. Environmental Legislations and Acts: a. Environment (Protection) Act b. Air (prevention and control of pollution) Act c. Water (Prevention and control of pollution) Act d. Wildlife protection Act e. Forest conservation Act 10. Human Population and Environment: • Population growth and explosion • Environment and Human health • Value education • Role of Information Technology in Environment and Human health	5Hrs
Total Contact Hrs		13

- *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment, Case study

Field work:

- Visit to local area to document environmental assets river / forest / Grassland/ Mountain
- Visit to a local polluted site— urban / rural / industrial / agricultural

Text Book:

1. N Arumugam, M.Duraiaraju and V.Kumaresan – (2018 Reprint) – Environmental Studies

Books for Reference:

1. Odum E. P. (1971) 1st edition. Fundamentals of ecology W. B. Saunders Company, London
2. Verma and Agarwal (2003) 5th edition. Principles of Ecology S. Chand & Company, Ltd New Delhi, 110055
3. Agarwal, K.C.(2001) Environmental Biology, Nishi Publ. Ltd. Bikaner.

4. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd. , Ahmedabad — 13, India, Email: mapin@icenet.net
5. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB).
Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001.
6. Environmental Encyclopedia, Jaico Publ. House. Mumbai, 1196p.

Mapping

CO \ PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	H	H
CO2	H	M	H	H	H
CO3	M	S	S	M	M
CO4	M	H	H	H	H

S-Strong; H-High; M-Medium; L-Low

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 Co-ordinator, Curriculum Development Cell (CDC)
 NGM College, Pollachi – 642 001.

