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-Semeste	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	-	-	-	-	-
	18UBY1A1	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	2
	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
	18UBY2A2	Allied Botany Paper –II: Economic Zoology	6	3	25	75	100	4
	18UBY2A3	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	18 UNC401/ 18UNS 402/ 18 USG 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

		Security						
IV	18UZY5S1/ 18UZY5S2	Apiculture (SBE) / Insect pest management (SBE)	1	2	-	50	50	2
	18GKL501	General Knowledge & General Awareness (SBE)	SS	2	-	50	50	2
	18HEC505	HE – (National values & SKY Yoga practice -V)	1	2	25	25	50	1
							650	**25**
	Semester VI							
III	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 value s& 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 URR 405	Red Ribbon Club
6.	18 UYR 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	$\frac{75+75+25}{7}$	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. P. R. Balasubramanian Signature:	Dr. M. Durairaju Signature:	Dr. R. Muthukumaran 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
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:** Plasmodium vivax – structure Life cycle – Cycle of Golgi - Cycle of Ross *Pathogenicity and control of Malaria* Economic importance of Protozoa.	**16Hrs**
Unit II	**Phylum – Porifera** : Leucosolenia - Structure - Reproduction and Life cycle Canal system in sponges. **Phylum – Coelenterata:** Obelia – Structure - Reproduction and Life cycle. Polymorphism. Coral reefs – Types and Formation.	**16Hrs**
Unit III	**Phylum – Helminthes:** *Taenia solium* – Structure Reproductive system and Life cycle. Parasitic adaptations in Helminth worm. **Phylum – Annelida** : Earthworm – Structure - Digestive system - Excretory system and Reproductive system. Metamerism in Annelids.	**15Hrs**
Unit IV	**Phylum – Arthropoda**: Cockroach – 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 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., Soundarapandian N and Arumugam, N**.** (2017) 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) 3rdEdition 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

PSO / CO	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 Signature:	Dr. P. R. Balasubramanian Signature:	Dr. M. Durairaju Signature:	Dr. R. Muthukumaran Signature:

Programme code:	B. Sc	**Programme Title :**	Zoology	
Course Code:	18UZY203	**Title**	**Batch :**	2018-2021
		Major Practical -I Non - Chordata and Chordata	**Semester**	I & II
Hrs/Week:	2		**Credits:**	4

Course Objective

- To study the morphology and anatomy of invertebrates and vertebrates

Course Outcomes (CO)

K3 K4	CO1 CO2	To remember external and internal features of organisms 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 – Synsacrum
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) Rhacophorous
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.ento.vt.edu.
6. www.petaindia.com

Mapping

PSO / CO	**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	Verified by HOD	Checked by	Approved by
Name and Signature Ms. S. Jayalakshmi Signature:	Name and Signature Dr. P. R. Balasubramanian Signature:	CDC Dr. M. Durairaju Signature:	COE Dr. R. Muthukumaran 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**	I
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 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 :** *Taenia solium* **–** Structure - Reproduction and Life cycle. **Phylum: Arthropoda**:*Cockroach – 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.P Camp Road, Periavillai, 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. –I, 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

PSO / CO	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. Somasundaram Signature:	Dr. P. R. Balasubramanian Signature:	Dr.M.Durairaju Signature:	Dr.R.Muthukumaran Signature:

Programme code:	B. Sc	**Programme Title :**	Zoology	
Course Code:	18UZY2A3	**Title**	**Batch :**	2018-2021
		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 significance: 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, Nagarcoil, Kanyakunari

2. Arumugam .N. (2017) Practical Zoology Chordata Volume -II First edition. Saras publication, Nagarcoil, Kanyakunari

Mapping

PSO / CO	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	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	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:	18UZY202	**Title**	**Batch :**	2018-2021
		Chordata	**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. ❖ *Parental care in Fishes*	**13Hrs**
Unit II	**Class: Amphibia Type – Frog** **Systems:** Externals - Girdles and Limbs - Respiratory system – Brain - Cranial nerves and Urino-genital system. ❖ Origin of Amphibia.	**13Hrs**
Unit III	**Class: Reptilia Type – Calotes** **Systems:** Externals - 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**: 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 – 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, Periavillai, 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

PSO / CO	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 Signature:	Dr. P. R. Balasubramanian Signature:	Dr. M. Durairaju Signature:	Dr. R. Muthukumaran Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	18UBY2A2	Title	Batch :	2018-2021
		Ancillary Botany 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 bee keeping, silkworm rearing, poultry keeping, dairy farming aquaculture

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. Fin fishes • Oyster culture 1. Edible oyster 2. Pearl oyster 3. Pearl formation	**16Hrs**
Unit -II	**APICULTURE** • Scope of Apiculture • Brief account of *A. indica, A. mellifera and A. dorsata* • Structure of Bee Hive • Products of Bee Keeping 1. Royal jeely 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 *Bombyx mori* • Rearing appliances • Disinfection • Diseases of silkworm	**16Hrs**

	1. Pebrine 2. Viral flacherie • Cocoon market	
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** • Construction of poultry house • Rearing of Broilers • Rearing of Layers • Diseases of poultry 1. Fowl pox 2. Coccidiosis 3. Ranikhet disease 4. Bird Flu • *Nutritive value of Egg*	**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. (2017) Applied Zoology, Saras Publication, 114/35 G ARP Camp Road, Periavilai, 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, Periavilai, Nagercoil, Kanyakumari – 629 002
3. Shukla & Upadhya,(2001) Economic Zoology - Rastrogi Publication, Shivaji Road, Meerut 250 002
4. Arumugam, N. (2012) Aquaculture -, 1st edition, Saras Publication, 114/35 G ARP Camp Road, Periavilai, Nagercoil, Kanyakumari – 629 002
5. Ezhili, N. & Thirumathal, K. (2008) A hand book for sericulture, Shrishti Impression, Coimbatore
6. Tripaty, S.N. (2004) Food biotechnology. Doarinant Publishing and distributions, New Delhi. 110 002.

Mapping

PSO / CO	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. 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	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 – Trilaminar model - Bimolecular 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 – mDNA - 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 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. (2017) Cell Biology –– Saras Publication, 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, 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

PSO / CO	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
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:	18UZY406	**Title**	**Batch :**	2018-2021
		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.
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** 1. Human Immuno Deficiency Virus. 2. E. coli Bacterium 3. A typical animal cell 4. Interface Nucleus 5. Lamp brush chromosome 6. Mitosis – stages 7. Meiosis - stages 8. DNA – Watson & Crick Model **GENETICS** 1. Drosophilla – Male and Female 2. Gynandromorph 3. Hairy Pinna 4. Twins 5. Erythroblastosis Foetalis 6. Kleinfelter's Syndrome 7. Down Syndrome 8. Turner's Syndrome 9. Free – martin 10. 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, Nagarcoil, Tamil Nadu
2. Lal, S. S. (2008). A text book of Practical Zoology. Rastogi Publications, Shivaji Road, Meerut.

Mapping

PSO / CO	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	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	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 :	2018-2021
		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**

- *Italics 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. Rastrogi Publications, New Delhi
3) Jordon, E.L. and Verma. P.S. (1995) Invertebrate Zoology. 12th edn. Sultan Chand & Co

Mapping

PSO / CO	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. 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 :	2018-2021
		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
	  o Digestive system
	  o 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

Books for Study:

1. Arumugam, N. (2015) 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.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

PSO / CO	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	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Dr.P.R.Balasubramanian Signature:	Dr.P.R.Balasubramanian Signature:	Dr.M.Durairaju Signature:	Dr.R.Muthukumaran 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
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** o Coat colour in Rabbit o ABO blood groups in man – Rh factor – problems	**19Hrs**
Unit II	• **Linkage** Complete and incomplete linkage • **Chromosome maps**: Interference and Coincidence - chromosome map in Drosophila (Three Point Cross) • **Sex determination**: o XX – XY type – Man o ZZ –ZW type – Fowl o Bridge's genic balance theory o Hymenopteran type – Honey bee o Gynandromorph – Drosophila o Hormonal control – Free Martin Cattle.	**18Hrs**
Unit III	• **Sex linked inheritance** o Eye colour in Drosophila o Haemophilia and colour blindness in man – problems • **Variation in chromosome number** Euploidy and Aneuploidy • **Syndromes** o Autosomal – Down syndrome and Patau's syndrome. o Allosomal – Klienfelter's syndrome and Turner's syndrome	**18Hrs**
Unit IV	• Pedigree analysis • *Twins* • **Inborn Errors of metabolism** o Phenylketoneuria o Alcaptonuria o Albinism • **Eugenics** o Positive o Negative	**18Hrs**

Unit V	• **Nucleic acids as genetic material** DNA and RNA. o **Mutation**:Detection of mutations – CIB method in Drosophila o Molecular basis of gene mutation – Substitution mutations and Frame shift mutations • **Population Genetics** o Gene pool o Gene frequency and genotype frequency o 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, Periavillai, 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. (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. Kendhranath, 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. Hydrabad, 500029.

Mapping

PSO / CO	**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	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	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:	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	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 • *Digestion and absorption*	**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 • *Methods of purification of potable water* • 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. Srilakshmi, B. (2012) 5th edition. Food Science, New age International Publishers, New Delhi

Books for Reference:

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

Mapping

PSO / CO	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	Verified by HOD	Checked by	Approved by
Name and Signature Dr. S. Somasundaram Signature:	Name and Signature Dr. P. R. Balasubramanian Signature:	CDC Dr. M. Durairaju Signature:	COE Dr. R. Muthukumaran Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	18UZY4N4	Title	Batch :	2018-2021
		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; *Clinical trials*	**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", Tailor 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 Pharamaceutial sciences, (2000) 18th edtion, Mack publishing & Co., Easton, PA.

Mapping

PSO / CO	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	Verified by HOD Name and Signature	Checked by CDC	Approved by COE
Ms. S. Jayalakshmi Signature:	Dr. P. R. Balasubramanian Signature:	Dr. M. Durairaju Signature:	Dr. R. Muthukumaran 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 *InVitro Fertilization(IVF)* **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 (Epiboly& Emboly). • Mechanism of morphogenetic movements **Example**: Gastrulation in frog • Exo gastrulation • Fate map • Development and significance of fetal membranes in chick.	**13Hrs**
Unit -III	• **Organogenesis in Frog** -Ectodermal (Brain) -Mesodermal (Heart) -Endodermal (Alimentary canal) • **Placentation in mammals** Classification based on	**13Hrs**

	-Fetal membranes -Distribution of villi -Histology • Functions of placenta • **Stem cells:** embryonic &adult • *Embryonic stem cell culture and applications*.	
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. • **Hormonal disorders:** Pancreas (Diabetes mellitus) Thyroid (Goiter) Pituitary (Gigantism - Dwarfism) Sex hormones (Infertility).	**13Hrs**
Total Contact Hrs		**65**

- *Italics denoted as self study topics*

Power point Presentations, Seminar , Assignment, Discussion, Activity

Books for Study:

1. Arumugam .N. (2017) Developmental Zoology - Saras Publication,114/35G, A.R.P Camp Road, Periavilai, Kottar Post, Nagercoil - 629002 , Tamilnadu, India, 2011
2. Verma P S & Agarwal V K (2012) Chordate embryology-S Chand & Company Ltd

Books for Reference:

1. Berrill, W. J. and Graw 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. Balinsky, 5th Edition ,Embryology - Philadelphia, Saunders College Publishing.
4. Sreekumar S. (2010) Edition. Basic Physiology –, PHI Learning Pvt. Ltd, New Delhi.
5. Sastry, K.V. (2009-2010) Endocrinology & Reproductive Biology –Rastogi Publications, Shivaji road, Meerut-250002, India.
6. Prakash S. Lohar. (2005) Endocrinology. MJP Publishers, Chennai.

Mapping

PSO / CO	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. Somasundaram Signature:	Dr. P. R. Balasubramanian Signature:	Dr.M.Durairaju Signature:	Dr. R.Muthukumaran Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	18UZY508	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 λDNA • 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 o Explants o Culture media o Culture of animal tissues • Animal bioreactors o Selection and modification of micro-organisms o Preparation of animal o Product harvest o Application of animal bio-reactors o Nano- biotechnology	**13Hrs**
Unit V	• Bacillus thuringensis as a pesticide • Biofertilizer	**13Hrs**

	• Biosensors- Biochips
	• Biodegradable plastics
	• Biosafety
	  o *Possible dangers of GEO's*
	  o Implementation of biosafety guidelines
	• Bioethics
	  o Monitering the welfare of transgenic animals
	  o Keeping of transgenic animals	

Total Contact Hrs		**65**

- *Italics denoted as self study topics*

Power point Presentations, Seminar, Assignment,

Books for Study:

1. Kumaresan V. and Arumugam N (2017) Animal Biotechnology –Saras publications, 114/35G, A.R.P Camp Road, Periavilai, Kottar Post, Nagercoil - 629002 , Tamilnadu, India
2. 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. Dubey, R. C. (1996) A text book of Biotechnology, Cambridge University Press
3. Molecular Biology and Biotechnology (1993) S.Chand & Company Ltd, NewDelhi
4. John.E.Smith, (1993) Biotechnology, Vikas Publishing House Pvt. Ltd, New Delhi
5. Balasubramaniam. D. C.F. A. Bryce, Dharmalingam. K. J. Green, Kunthala Jayaraman (2005) Concepts in Biotechnology, University Press (India) Pvt. Ltd. Hydrabed
6. Jayanto Achrekar (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, Periavilai, Kottar Post, Nagercoil - 629002 , Tamilnadu, India

Mapping

PSO / CO	**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	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Dr.P.R.Balasubramanian Signature:	Dr.P.R.Balasubramanian Signature:	Dr.M.Durairaju Signature:	Dr.R.Muthukumaran Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	18UZY509	Title	Batch :	2018-2021
		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 Continues 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)	**13Hrs**

	➢ 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, Periavillai, 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, Periavillai, 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

PSO / CO	**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. Durairaju Signature:	Dr. P. R. Balasubramanian Signature:	Dr. M. Durairaju Signature:	Dr. R. Muthukumaran Signature:

Programme code:	B. Sc	**Programme Title :**	Zoology	
Course Code:	18UZY510	**Title**	**Batch :**	2018-2021
		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** o Code of conduct for laboratory personnel o Structure of a laboratory • **Laboratory instruments** o Centrifuge o Autoclave o ECG o B. P. apparatus and stethoscope o Automatic analyzer o General procedure – cleaning -Sterilization and disposal of infected materials o *Safety measures and first aid*	**13Hrs**
Unit II	• **Haematology** o Blood collection o Anticoagulant - Ammonium & Potassium oxalate mixture o Bleeding time and clotting time o Staining of blood films o Estimation of haemoglobin o Blood cell total count - RBC and WBC o Erythrocyte Sedimentation Rate (ESR) o Glucose Tolerance Test (GTT) o Blood glucose o *Anaemia- Iron deficiency anaemia*	**13Hrs**
Unit III	• **Urine Analysis** o Collection & preservation of urine o Physical examination o Chemical examination o Microscopic analysis • **Faeces Analysis** o Collection & preservation o Physical examination o Microscopic examination	**13Hrs**
Unit IV	• **Sputum Analysis** o Collection & preservation o Naked eye inspection o Microscopic examination o Chemical examination	**13Hrs**

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

- *Italics denoted as self study topics*

- Assignment ,Seminar

Books for Study:

1. Samuel, K. M. (1982) Notes on Clinical Lab Techniques. K. Gopalan publishers, Madras
2. Ramnik Sood, MLT. (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

PSO CO	**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 Signature:	Dr. P. R. Balasubramanian Signature:	Dr. M. Durairaju Signature:	Dr. R. Muthukumaran Signature:

Programme code:	B. Sc	**Programme Title :**	Zoology	
Course Code:	18UZY511	**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
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
	• *Bioinformatics tools and its uses*
		(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, Periavillai, 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. Fuelker , 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- Dominent Publisher, New Delhi

Mapping

PSO / CO	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	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	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:	18UZY617	**Title**	**Batch :**	2018-2021
		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 heamoglobin
- 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)** • Heamocyto meter • Sahli's heamometer • 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, Periavilai, 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 P|hysiology . Saras publication. Nagarcoil, 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. P. R. Balasubramanian Signature:	Dr. M. Durairaju Signature:	Dr. R. Muthukumaran 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	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 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
- 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
- Netrika/chandrika
- 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 Skill/observation	10	Experiments	20
			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 SARAS Publications, Nagercoil, Tamilnadu.
6. ICAR Publication (2006) 1st edition. Hand book of fisheries and aquaculture, Directorate of information and publicatios of agriculture. Indian Council of Agricultural Research, New Delhi

Mapping

PSO / CO	**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.P.R.Balasubramanian Signature:	Dr.P.R.Balasubramanian Signature:	Dr.M.Durairaju Signature:	Dr.R.Muthukumaran Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	18UZY5S1	Title	Batch :	2018-2021
		Apiculture (SBE)	Semester	V
Hrs/Week:	1		Credits:	2

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

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
Unit- I	Scope of Apiculture Classification of honey bee Types of honey bee – *Apis dorsata- Apis indica - Apis florae- Apis mellifera* 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, Medicinal 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 Doolittle method.	**3Hrs**
Total Contact Hrs		**13**

- *Italics denoted as self study topics*

Power point Presentations, Seminar , Assignment, Discussion

Books for Study:

1. Arumugam N. (2017) Applied Zoology, Saras Publication, 114/35 G, A.R.P Camp Road, Periavillai, 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, NewJersey, Pennsylvania, West Virginia & the USDA Co-operating PENNSTATE 1855- E-book

Mapping

PSO / CO	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. Somasundaram Signature:	Dr. P. R. Balasubramanian Signature:	Dr. M .Durairaju Signature:	Dr. R. Muthukumaran Signature:

Programme code:	B. Sc	**Programme Title :**	Zoology	
Course Code:	18UZY5S2	**Title**	**Batch :**	2018-2021
		Insect Pest Management(SBE)	**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 Mechanical *Cultural - biological and legal control*	**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 *Integrated Pest Management*	**2Hrs**
Unit V	(Major Local Agricultural pest and their Management) Cotton – The cotton Boll worm – *Helicoverpa armigera* Coconut – The Rhinoceros beetle – *Oryctes rhinoceros* Groundnut – The Red hairy caterpillar – *Amsacta albistriga* Sugarcane – The sugarcane stem bore- *Chilo infuscatellus*	**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

PSO / CO	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. P. R. Balasubramanian Signature:	Dr. M. Durairaju Signature:	Dr. R. Muthukumaran 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**: *Structure of mammalian kidney* Structure of Nephron Synthesis of ammonia - urea and uric acid Formation of urine in Human	**13Hrs**
Unit- II	• **Water Balance:** Osmatic 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	**13Hrs**

	• **Reproductive system:** ○ Sexual cycle in human: Puberty – Spermiation – Ovulation - Menstrual cycle - Pregnancy and Parturition.	
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:** ➢ 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	**13Hrs**
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 ➢ *Vitamins: Water soluble & Fat soluble.*	**13Hrs**
Total Contact Hrs		**65**

- *Italics denoted as self study topics*

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

Books for Study:

1. Thulsi Fatima, (2017) Biochemistry - Saras Publication,114/35G, A.R.P Camp Road, Periavilai, Kottar Post, Nagercoil - 629002 , Tamil nadu, India
2. Arumugam N. (2017) Animal physiology- Saras Publication, 114/35G, A.R.P Camp Road, Periavilai, Kottar Post, Nagercoil - 629002 , Tamil nadu, India

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. 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

PSO / CO	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. 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)

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. ➢ *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** • *Urey 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	• **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, Periavillai, Kottar PO, Nagercoil -629 002, Kanyakumari
2. Arumugam N. (2015) Organic Evolution–- Saras publication 114/35 G, A.R.P Camp Road, Periavillai, 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

PSO / CO	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	Verified by HOD	Checked by	Approved by
Name and Signature Dr. M. Durairaju Signature:	Name and Signature Dr. P. R. Balasubramanian Signature:	CDC Dr. M. Durairaju Signature:	COE Dr. R. Muthukumaran Signature:

Programme code:	B. Sc	Programme Title :	Zoology	
Course Code:	18UZY614	Title	Batch :	2018-2021
		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,Medicalmicrobiology
K4	CO4	To analyse disease producing microorganism

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**: o Major features and structure of bacteria o Economic importance of bacteria o Bacterial growth and Growth curve o Bacterial culture – Culture of *E.Coli* • **Viruses**: o Characteristic and structure of viruses o classification of virus	**13Hrs**
Unit III	• **Applied microbiology** o **Agricultural microbiology**: ▪ Role of microorganism in soil fertility ▪ Biofertilizers ▪ Harmful role of microorganism. o **Food microbiology**: ▪ Microorganisms of food ▪ Factors influence microbial growth ▪ *Food spoilage- Food preservation* o **Medical microbiology** ▪ Normal microflora of human body ▪ Bacterial Diseases -Boutilism, Cholera ▪ Viral Diseases – Measles, Viral hepatitis	**13Hrs**
Unit IV	• **Immunology** o Introduction and scope of immunology o Classification of Immunity – Innate and Acquired o Lymphoid Organs o Cells of the immune system – T and B Cells	**13Hrs**
Unit V	• Structure and classes of immunoglobins • Classification of Major Histocompatability Complex- (MHC) • Tumour immunology o *Properties of tumour cells* o Immune diagnosis and immunotherapy of tumour	**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, L. M. and Arumugam, N. (2007) Microbiology. Saras publications, 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, Nagercoil -629 002, Kanyakumari
2. Dulsy Fatima and N. Arumugam. Immunology, (2001) Saras Publications, 114/35 G, A.R.P Camp Road, Periavillai, 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

PSO / CO	**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	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Ms. S. Jayalakshmi Signature:	Dr. P. R. Balasubramanian Signature:	Dr. M. Durairaju Signature:	Dr. R. Muthukumaran 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.
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: Bombyx mori 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 o Cutting o Layering o 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 Bombyx mori • Structure of silk worm • Structure of Silk gland • Grainages • 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: o Pebrine o Viral Flacherie (IFV) o Grasserie :Nuclear Polyhedrosis (NPV) • Indian Uzi fly (Pest of silk worm)	**11 Hrs**
Unit V	• *Physical characteristics of cocoons*	**10 Hrs**

	• Defective cocoons • Reeling appliance - Country Charkha • Cocoon Markets • Raw silk testing	
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 Narasimhanna. 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

PSO / CO	**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	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Ms. S. Mariselvi Signature:	Dr. P. R. Balasubramanian Signature:	Dr.M.Durairaju Signature:	R.Muthukumaran Signature:

Programme code:	B.Sc	Programme Title :	Zoology	
Course Code:	18UZY616	Title	Batch :	2018-2021
		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 • *Aquaculture in India* • General character and adaptations in fishes • General Organisation of fish ➢ Teleost – *Labeo rohita* ➢ 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 SARAS Publications, Nagercoil, 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. Charls L 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 publicatios 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

PSO / CO	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	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Dr.P.R.Balasubramanian Signature:	Dr.P.R.Balasubramanian Signature:	Dr.M.Durairaju 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. *Economic importance of vermiculture*	**(3Hrs)**
Unit II	Type study: Earthworm: Megascolex 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 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) Vemicomposting for sustainable agriculture. Agrobios. Jothpur. 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

PSO / CO	**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 Signature:	Dr.P.R.Balasubramanian Signature:	Dr.M.Durairaju Signature:	Dr.R.Muthukumaran Signature:

Programme code:	B. Sc	**Programme Title :**	Zoology	
Course Code:	18UZY6S4	**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 • *Summer management - Winter management* • 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	• *Nutritive value of poultry meat and egg* • Grading and Preservation of eggs • Packing and Transport and Marketing • Different uses of eggs	**2Hrs**

	• Poultry manure**.**	
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

PSO / CO	**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	Verified by HOD	Checked by	Approved by
Name and Signature	Name and Signature	CDC	COE
Dr.P.R.Balasubramanian Signature:	Dr.P.R.Balasubramanian Signature:	Dr.M.Durairaju Signature:	Dr.R.Muthukumaran 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. 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	**5Hrs**

	• Hot – Spots of Biodiversity • Threats to biodiversity • Endangered and Endemic Species of India • Conservation of biodiversity	
Unit III	**5. . Environmental Pollution:** • Causes, effects and control measures of a. Air Pollution b. Water pollution 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	**6Hrs**
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.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, Nidi 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

PSO / CO	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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