

**ST. JOSEPH'S COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS)**

CUDDALORE – 1



DEPARTMENT OF ZOOLOGY

BOARD OF STUDIES

a) B.Sc., Zoology

2023-2026

ODD-SEM-MAY-2023

St. Joseph's College of Arts and Science (Autonomous)

Cuddalore - 607001

Name of the Department : Department of Zoology

Details of the Expert Members in the Board of Studies

S.No.	Category	Name and Official Address	Phone No.& E-Mail ID
1.	Chairman	Dr. P. Thenmozhi Asst. Professor & Head, Department Of Zoology, St. Joseph's College of Arts & Science (Autonomous), Cuddalore-1	Mobile: 9442640469 E.mail: thenmozhi@sjctnc.edu.in
2.	University Nominee	Dr. M. Muthulingam Associate Professor, Department of Zoology, D.G. Govt. Arts College for Women, Mayiladuthurai	Mobile: 9843629002 E. mail: muthuau@rediffmail.com
3.	Subject Experts	Dr. G.Chinnadurai Associate Professor, Department of Zoology, Periyar Govt. Arts. College, Cuddalore-1	Mobile: 9442382913 E. mail: chinnadurai@pacc.in
4.	Subject Experts	Dr. S. Muthalagi Assistant Professor, PG and Research Department of Zoology, Thiru Kolanjiappar Govt. Arts College, Virudhachalam Cuddalore 606001.	Mobile: 9486586092 E.Mail : muthalagis@gmail.com

a) B.Sc., Zoology Internal Members

1.	Members (Internal)	Dr. A. Arulprakash Asst. Professor, Department of Zoology, St. Joseph's college of Arts & Science (Autonomous), Cuddalore-1	Mobile: 9788258603 E. mail: arul_prakash@sjctnc.edu.in
2.	Members (Internal)	Dr. T. Ganeshkumar Asst. Professor, Department of Zoology, St. Joseph's college of Arts & Science (Autonomous), Cuddalore-1	Mobile: 9080466300 E. mail: ganesh@sjctnc.edu.in
3.	Members (Internal)	Dr. N. Jayaprabha Asst. Professor, Department of Zoology, St. Joseph's college of Arts & Science (Autonomous), Cuddalore-1	Mobile: 9003681552 E. mail: jayaprabha@sjctnc.edu.in
4.	Members (Internal)	Dr. S. Pravina Mary Asst. Professor, Department of Zoology, St. Joseph's college of Arts & Science (Autonomous), Cuddalore-1	Mobile: 9597329327 E. mail: pravinamary@gmail.com

MINUTES OF THE BOARD OF STUDIES
DEPARTMENT OF ZOOLOGY

The meeting of the Board of Studies for **Department of Zoology** was held on **09.11.2023** at **2.30 p.m.** The Chairman **Dr. P. Thenmozhi** welcomed and introduced the members.

Business brought forward/ Discussions/ Resolutions.

No changes had been made in the syllabi for the 2021-2024 and 2022-2025 batches. As it was proposed to follow TANSCHER Syllabus for the first semester for I year UG, the non-semester pattern for practical is being shifted to semester pattern. Accordingly Invertebrata and Chordata are being separated for the first and second semester respectively. No other changes were suggested regarding the syllabus etc., and hence remain unchanged.

Dr. A. Arulprakash proposed the vote of thanks.

With this the meeting came to an end at 3.30 p.m.

I. UG

DEPARTMENT OF ZOOLOGY

CURRICULUM TEMPLATE (2023-2026)

a) B.Sc., Zoology

SEMESTER – I

S.No	PART		HOURS/ WEEK	CREDITS	COURSE CODE	COURSE TITLE	Maximum Marks		
							CIA	ESE	TOTAL
1.	I	Language – I	6	3	LT101A/LH101S/LF101	Tamil-I / Hindi-I / French-I	25	75	100
2.	II	General English – 1	6	3	LE101B	Communicative English - I	25	75	100
3.	III	Core - I: Invertebrata	6	6	ZO101A	Invertebrata	25	75	100
4.	III	Core - Practical – I:	3	2	ZOP101	Practical – I Invertebrata	40	60	100
5.	III	Allied -1 Botany - I	3	2	ABZ101B	Allied Botany	25	75	100
6.	III	Botany Practical	2	2	ABZP11A	Allied Botany Practical	40	60	100
7.	IV	Skill Enhancement Course SEC-1 (NME)	2	2	NZO101	Biocomposting for Entrepreneurship	25	75	100
8.	IV	FC-1	2	2	FZO101	Ornamental Fish Farming and Management	25	75	100
Total credits for Semester I			30	22			230	570	800

SEMESTER – II

S.No	PART		HOURS	CREDITS	COURSE CODE	COURSE TITLE	Maximum Marks		
							CIA	ESE	TOTAL
9.	I	Language – II	4	3	21LT02//LF202/LH202S	Tamil/French/Hindi-II	25	75	100
10.	II	English – II	4	3	LE202B	Communicative English-II	25	75	100
11.	III	Core – II	4	3	19ZO203	Chordata-I	25	75	100
12.	III	Core – III	4	3	19ZO204	Chordata-II	25	75	100
13.		Core Practical-II	3	2		Practical – II	40	60	100

	III				ZOP202	Chordata			
14.	III	Allied II (Compulsory)	4	4	21ACH201	Allied Chemistry	25	75	100
15.	III	Allied Practical II	3	2	19ACP202	Allied Chemistry Practical	40	60	100
16.	IV	SDC	2	2	EFE202	Effective English (Naan Mudhalvan)	25	75	100
17.	IV	SEC – II	2	2	EPD201A	Dynamics of Personality	25	75	100
		Total credits for Semester II	30	24			255	645	900
SEMESTER – III									
S. No.	PART		HOURS	CREDITS	COURSE CODE	COURSE TITLE	Maximum Marks		
							CIA	ESE	TOTAL
18.	I	Language – III	4	3	LT303A//LF3 03/LH303S	Tamil/French/Hindi- III	25	75	100
19.	II	English – III	4	3	LE303A	Communicative English-III	25	75	100
20.	III	Core – IV	4	3	19ZO305	Cell Biology	25	75	100
21.	III	Core – V	4	3	19ZO306	Molecular Biology	25	75	100
22.	III	Core Practical- III	3	-	19ZOP42	Practical – II Cell and Molecular biology, Genetics and Biotechnology			
23.	III	Allied III	5	3	19ABC303	Allied Biochemistry	25	75	100
24.	III	Allied Practical III	3	2	19ABP303	Allied Biochemistry Practical	40	60	100
25.	IV	AEC – I	3	2	EVS301S	Environmental Science	25	75	100
		Total credits for Semester III	30	19			190	510	700
SEMESTER – IV									
S.N o.	PART		HOURS	CREDITS	COURSE CODE	COURSE TITLE	Maximum Marks		
							CIA	ESE	TOTAL
26.	I	Language – IV	4	3	LT404A//LF4 04/LH404S	Tamil/French/Hindi- IV	25	75	100
27.	II	English – IV	4	3	LE404A	Communicative English-IV	25	75	100
28.	III	Core – VI	4	3	19ZO407	Genetics	25	75	100
29.	III	Core – VII	4	3	19ZO408	Biotechnology	25	75	100
30.	III	Core Practical – III	3	4	19ZOP42	Practical – II Cell and Molecular biology,	40	60	100

						Genetics and Biotechnology (Contd.)			
31.	III	Allied –IV	4	3	19AMB404	Allied Microbiology	25	75	100
32.	III	Allied Practical – IV	3	2	19AMP404	Allied Microbiology Practical	40	60	100
33.	III	NME	2	2	NPHEL401	Physics for Everyday Life	25	75	100
34.	IV	SDC	2	2	ZOOF403	Office Fundamentals (Naan Mudhalvan)	25	75	100
		Total for Semester IV	30	25			255	645	900

SEMESTER – V

S.No	PART	HOURS	CREDITS	COURSE CODE	COURSE TITLE	Maximum Marks			
						CIA	ESE	TOTAL	
35.	III	Core – VIII	5	4	20ZO509	Biostatistics and computational Biology	25	75	100
36.	III	Core – IX	5	4	20ZO510	Developmental Biology and Immunology	25	75	100
37.	III	Core – X	5	4	20ZO511	Animal Physiology	25	75	100
38.	III	Elective – I [Compulsory]	5	3	20EZ512A	Applied Entomology	25	75	100
39.	III	Elective – II [Optional]	4	3	20EZ513A	A. Biofertilizer Technology	25	75	100
					20EZ513B	B. Public Health and hygiene			
40.	III	Core Practical – IV	3	-	20ZOP63	Biostatistics, Animal Physiology, Developmental Biology and Immunology			
41.	III	Core Practical – V	3	-	20ZOP64	Environmental Biology, Economic Zoology and Evolution			
		Total credits for Semester V	30	18			125	375	500

SEMESTER – VI

S.No	PART		HOURS	CREDITS	COURSE CODE	COURSE TITLE		Maximum Marks		
								CIA	ESE	TOTAL
42.	III	Core – XI	5	4	20ZO614	Environmental Biology		25	75	100
43.	III	Core – XII	5	4	20ZO615	Economic Zoology		25	75	100
44.	III	Core – XIII	5	4	20ZO616	Evolution		25	75	100
45.	III	Elective – III [Compulsary]	4	3	20EZ617A	Aquaculture		25	75	100
46.	III	Skill based subject[optional]	3	3	20EZ618A	A	Bioinstrumentation	25	75	100
					20EZ618B	B	Sericulture			
47.	III	Core Practical – IV	3	4	20ZOP63	Biostatistics, Animal Physiology and Developmental Biology and Immunology (Contd.)		40	60	100
48.	III	Core Practical – V	3	4	20ZOP64	Environmental Biology, Economic Zoology and Evolution (Contd.)		40	60	100
49.	III	Project		2	JZO601	Project Work		50	50	100
50.	V			2	EU601	Extension Activities				
51.	IV	SDC	2	2	New code	Medical Coding (Naan Mudhalvan)		25	75	100
Total credits for Semester VI			30	32				280	620	900
Total Credits			180	140						

Extra Credit Course

S.No	Semester	Part	Credits	Course Code	Course Title
1	III	IV	1	XFZO31	Field Trip/Field Work
2	V	IV	2	XIZO501	Internship
4	VI	VI	2	19SZO51	Online Learning Course (e course)- SWAYAM/NPTEL
5	VI	VI	2	19ZOSS52	SSC-Self Study Course

Courses Offered to other Departments

SEMESTER – III

S.No	Part		Hours/ Week	Credit	Course Code	Course Title	Maximum Marks		
							CIA	ESE	TOTAL
1	III	Allied	5	4	19AZMB31	Classical Genetics & Biostatistics / Laboratory animal care (II Year MicroBiology)	25	75	100
2	III	Allied	3	2	19AZMP31	Classical Genetics & Biostatistics- Practical / Laboratory animal care (II Year MicroBiology)	40	60	100
3	IV	AEC	3	2	EVS301S/EVST301S	Environmental Science (All UG B.Sc/B.A/B.COM/B.C.A)	25	75	100

SEMESTER IV

S.No	Part		Hours/ Week	Credit	Course Code	Course Title	Maximum Marks		
							CIA	ESE	TOTAL
4	III	Allied	5	4	19AZMB42	Applied Entomology (II Year MicroBiology)	25	75	100
5	III	Allied	3	2	19AZMP42	Applied Entomology- Practical (II Year MicroBiology)	40	60	100
6	III	Allied	5	4	AZBC401T	Advanced Zoology-Theory (II Year Bio –Chemistry)	25	75	100
7	III	Allied	3	2	AZBP401	Advanced Zoology-Practical (II Year Bio –Chemistry)	40	60	100
8	IV	AEC	3	2	EVS401S	Environmental Science (All UG B.Sc/B.A/B.COM/B.C.A)	25	75	100

PROGRAMME OUTCOMES (POs)

UNDER GRADUATE PROGRAMME OUTCOMES (POs)

PO1:The students find their footings in life through wholesome and integral education.

PO2: The students are encouraged to climb the academic ladder by pursuing post graduate education in different domain.

PO3: The students are academically and technically equipped to steer the nation along the path of progress and peace.

PO4: The students are trained to be employable and entrepreneurial citizen of the nation.

PO5: The students are fortified intellectually, ethically and socially to face the challenges in life.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: *Disciplinary knowledge*

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

PSO2: *Critical thinking*

The students will obtain knowledge to express their concepts effectively by understanding their subject with various disciplines.

PSO3: *Scientific reasoning*

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

PSO4: *Research-related skills*

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

PSO5: *Problem solving*

The students will acquire knowledge in cell biology, molecular biology, genetics,

<p>biotechnology, microbiology, biochemistry, biostatistics, developmental biology, immunology, animal physiology, environmental biology, evolution etc., which helps to develop their ability to analyse and solve various biological problems.</p>
<p>PSO6: <i>Cooperation/Team work</i></p>
<p>The students will be able to work effectively and respectfully with diverse team during vermiculture and mushroom culture practices</p>
<p>PSO7: <i>Information/digital literacy</i></p>
<p>The students will be able to use various biological softwares to analyze the data by obtaining knowledge in biostatistics, computational biology and biotechnology.</p>
<p>PSO8: <i>Self-directed learning</i></p>
<p>The students will be able to work independently to enhance their expertise through various activities like seminars, assignments, etc., and they can manage a project like vermiculture, mushroom culture, aquaculture etc., on completion of the course.</p>
<p>PSO9: <i>Moral and ethical awareness/reasoning</i></p>
<p>The students will have the knowledge to minimize the environmental issues like global warming, pollution, degradation of natural resources, and helps in conservation endangered species, afforestation etc.</p>
<p>PSO10: <i>Lifelong learning</i></p>
<p>The students will be able to apply their knowledge of biological sciences in various disciplines like vermiculture, mushroom culture, aquaculture, apiculture, agriculture and medicine. And contribute the knowledge for Nations development.</p>

SYLLABUS

I B.Sc Zoology		ZO101A
SEMESTER - I	INVERTEBRATA	HRS/WK – 6
CORE – I		CREDIT – 6

Objective:

1. To understand the basic concepts of invertebrates and observe the structure and functions.
2. To illustrate and examine the systemic and functional morphology of various group of invertebrates.
3. To differentiate and classify the various groups of animals, modes of life and to estimate the biodiversity.
4. To compare and distinguish the general and specific characteristics of reproduction in invertebrates.
5. To infer and integrate the parasitic and economic importance of invertebrates

Course Outcomes (CO's):

On completion of the course students will be able

CO1: Understand the basic concepts of invertebrate animals and recall its structure and functions.

CO2: Illustrate and examine the systemic and functional morphology of various groups of invertebrata.

CO3: Differentiate and classify the animal's mode of life in various taxa and estimate the biodiversity.

CO4: To compare and distinguish the various physiological processes and organ systems in lower animals.

CO5: Infer and integrate the parasitic and economic importance of invertebrate animals.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER I	COURSE CODE: ZO101A	COURSE TITLE: INVERTEBRATA														HOURS: 6	CREDITS: 6
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	4	5	5	5	4	4	5	4	5	4	5	4.7	
CO2	5	5	5	5	4	5	5	5	4	4	5	3	5	4	5	4.6	
CO3	5	5	5	5	4	5	5	5	4	4	5	3	5	4	5	4.6	
CO4	5	5	5	5	4	5	5	5	4	4	5	3	5	4	5	4.6	
CO5	5	5	5	5	4	5	5	5	4	4	5	3	5	4	5	4.6	
Mean Overall Score																4.6	

Result: The Score of this Course is 4.6 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – 1: PROTOZOA AND PORIFERA

18 Hours

Protozoa: Introduction to Classification, taxonomy and nomenclature. General characters and classification of Phylum Protozoa up to classes. Type study - *Paramecium* and *Plasmodium* - Parasitic protozoans (*Entamoeba*, *Trypanasoma* & *Leishmania*) - Economic importance. - Host-parasitic interactions in *Entamoeba* and *Plasmodium*- Nutrition and Locomotion in protozoa

Porifera: General characters and classification up to Classes. Type study - Ascon & Sycon - Canal system in sponges - Skeleton in sponges, Reproduction in sponges Economic importance of sponges.

UNIT – 2: COELENTERATA AND PLATYHELMINTHS

18 Hours

Coelenterata : General characters and classification up to classes – Type study - *Obelia* and *Aurelia* - Corals and coral reefs - Polymorphism - Mesenteries in Anthozoa - Polymorphism in Hydrozoa. Economic importance of corals and coral reefs.

Platyhelminths: General characters and classification of up to classes. Type study – *Fasciola hepatica*. Nematelminthes: *Taenia solium* – Parasitic adaptations. Host-parasitic interactions of Helminth parasites. Nematode Parasites and diseases - *Wuchereria bancrofti*, *Enterobius vermicularis*, *Ancylostome duodenale*. Aschelminthes : General characters and classification of up to classes - Type study - *Ascaris lumbricoides*

UNIT–3:ANNELIDA AND ARTHROPODA

18 Hours

Annelida: General characters and classification up to Classes. Type study – *Nereis* and *Hirudinaria granulosa*. Metamerism Nephridium and coelomoducts - Modes of life in Annelids. Reproduction in polychaetes

Arthropoda: General characters and classification of Phylum Arthropoda up to Classes. Detailed study: *Penaeus indicus*. Affinities of *Peripatus* – Larval forms in Crustacea – Organization of Centipede and Millipede

UNIT – 4: MOLLUSCA

18 Hours

Mollusca: General characters and classification of Phylum Mollusca up to Classes. Detailed study: *Pila globosa*. Foot and torsion in Mollusca, Economic importance of Molluscs – Cephalopoda as the most advanced invertebrate.

UNIT – 5: ECHINODERMATA

18 Hours

Echinodermata: General characters and classification of Phylum Echinodermata up to Classes. Detailed study: *Asterias*. Water vascular system in Echinodermata – Larval forms of Echinoderms.

TEXT BOOKS

1. Arumugam, N., T. Murugan, B. Ramanathan and M.G Ragunathan. (2019). *A Text Book of Invertebrates*, Saras Publications, Nagercoil, Tamil Nadu.
2. Ekambaranatha Ayyar .M., (1973). *A Manual of Zoology – Part I, Invertebrata*. S.

Viswanathan Printers and Publishers Pvt., Ltd., Madras.

3. Jordon, E.L. and P.S Verma, (2014). *Invertebrate Zoology*. S. Chand and Co. Ltd., New Delhi
4. Adam Sedgwick, (1960). *A student's text book of Zoology, Vol. I & III*, General Book Depot, Allahabad.
5. Hyman, L.H. (1951). *The Invertebrates, Vol. I*, McGraw Hill Book Co., New York.
6. Kotpal.R.L., (2017). *Modern Text book of Zoology-Invertebrata, (Animal Diversity- I)*. Rastogi Publications, New Delhi.

REFERENCE BOOKS

1. Arumugam, N. (2014). *Animal diversity Volume -1 – Invertebrata*. Saras Publication, Nagercoil, Tamil Nadu
2. Fatik Baran. (2012). *Invertebrate Zoology*. **Prentice Hall of India** Pvt Ltd., New Delhi.
3. Barrington E.J.W. (2012). *Invertebrate structure and function*. Affiliated East West Press Pvt. Ltd., New Delhi.
4. Richard C. Brusca, Wendy Moore and Stephen M. Shuster. (2016). *Invertebrates*. **Oxford University Press**, USA.
5. Clarkson E.N.K. (2011). *Invertebrate Palaeontology and Evolution*. Wiley India Pvt. Ltd., New Delhi

I B.Sc Zoology	CORE PRACTICAL – I INVERTEBRATA	ZOP101
SEMESTER – I		HRS/WK – 3
CORE PRACTICAL – I		CREDIT – 2

MAJOR DISSECTION: Cockroach: Circulatory system, Nervous system, Reproductive system. Leech : Nervous System, Reproductive system. Earthworm: Nervous System, Reproductive system. *Pila globosa*: Nervous system. Prawn: Nervous system (including Appendages).

MINOR DISSECTION: Cockroach: Digestive system. Earthworm: Viscera, Lateral hearts.

Pila globosa: Digestive system (Including radula). Freshwater Mussel: Digestive system.

MOUNTING: Earthworm: Body setae; Pineal setae. *Pila globosa*: Radula. Freshwater muscle: Pedal ganglia.

MOUNTING : Cockroach: Salivary apparatus, Mouth parts - Honey Bee, House fly and Mosquito mouth parts.

SPOTTERS:(i). Protozoa: Amoeba, Paramecium, Paramecium Binary fission and Conjugation, Vorticella, Entamoeba histolytica, Plasmodium vivax **(ii). Porifera:** Sycon, Spongilla, Euspongia, Sycon - T.S & L.S, Spicules, Gemmule **(iii). Coelenterata:** Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatula **(iv). Platyhelminthes:** Planaria, Fasciola hepatica, Fasciola larval forms – Miracidium, Redia, Cercaria, Echinococcus granulosus, Taenia solium, Schistosoma haematobium **(v). Nematelminthes:** Ascaris(Male & Female), Dracunculus, Ancylostoma, Wuchereria **(vi). Annelida:** Nereis, Aphrodite, Chaetopteurs, Hirudinaria, Trochophore larva **(vii). Arthropoda:** Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Peripatus, Larvae - Nauplius, Mysis, Zoea, Mouth parts of male & female Anopheles and Culex, Mouthparts of Housefly and Butterfly. **(viii). Mollusca:** Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus, Glochidium larva **(ix). Echinodermata:** Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon, Bipinnaria larva

Text Books

(Latest Editions)

1. Ekambaranatha Iyyar and T. N. Ananthakrishnan, 1995 A manual of Zoology Vol.I (Part 1, 2) S. Viswanathan, Chennai.
2. Ganguly, Sinha and Adhikari, 2011. Biology of Animals: Volume I, New Central Book Agency; 3rd revised edition. 1008 pp.

3. Sinha, Chatterjee and Chattopadhyay, 2014. Advanced Practical Zoology, Books & Allied Ltd; 3rd Revised edition, 1070 pp.
4. Lal, S. S., 2016. Practical Zoology Invertebrate, Rastogi Publications.
5. Verma, P. S. 2010. A Manual of Practical Zoology: Invertebrates, S Chand, 497pp.

References Books

(Latest editions, and the style as given below must be strictly adhered to)

1. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science.
2. Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition. Holt Saunders International Edition.
3. Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
4. Boradale, L.A. and Potts, E.A. (1961). *Invertebrates: A Manual for the use of Students*. Asia Publishing Home.
5. Lal, S.S. 2005. A text Book of Practical Zoology: Invertebrate, Rastogi, Meerut

I B.Sc Zoology	ALLIED BOTANY	ABZ101B
SEMESTER – I		HRS/WK – 3
ALLIED/ ELECTIVE		CREDIT –2

Objective:

1. To study morphological and anatomical adaptations of plants of various habitats.
2. To demonstrate techniques of plant tissue culture.
3. To familiarize with the structure of DNA, RNA.
4. To carryout experiments related with plant physiology.
5. To perform biochemistry experiments.

Course Outcomes (CO)

At the end of the course, the student will be able to

CO1: Increase the awareness and appreciation of human friendly algae and their economic importance.

CO2: Develop an understanding of microbes and fungi and appreciate their adaptive strategies.

CO3: Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.

CO4: Compare the structure and function of cells and explain the development of cells.

CO5: Understand the core concepts and fundamentals of plant biotechnology and genetic engineering.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER I	COURSE CODE: ABZ101B					COURSE TITLE: ALLIED BOTANY										HOUR S: 3	CRED ITS:2
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	4	5	4	4	2	3	5	1	5	1	5	4.0	
CO2	5	5	5	5	4	5	4	3	4	4	5	1	5	1	5	4.1	
CO3	5	5	4	5	4	5	4	3	3	4	5	1	5	2	5	4.0	
CO4	5	5	4	5	4	5	4	3	3	3	5	1	5	3	5	4.0	
CO5	5	5	4	5	4	5	4	3	2	4	5	2	5	3	5	4.1	
Mean Overall Score																4.0	

Result: The Score of this Course is 4.0 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – 1: ALGAE:**9 Hours**

General characters of algae - Structure, reproduction and life cycle of the following genera - *Anabaena* and *Sargassum* and economic importance of algae.

UNIT – 2: FUNGI, BACTERIA AND VIRUS:**9 Hours**

General characters of fungi, structure, reproduction and life cycle of the following genera - *Penicillium* and *Agaricus* and economic importance of fungi.

Bacteria - general characters, structure and reproduction of *Escherichia coli* and economic importance of bacteria. Virus - general characters, structure of TMV, structure of bacteriophage.

UNIT – 3: BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS: 9 Hours

General characters of Bryophytes, Structure and life cycle of *Funaria*.

General characters of Pteridophytes, Structure and life cycle of *Lycopodium*.

General characters of Gymnosperms, Structure and life cycle of *Cycas*.

UNIT – 4: CELL BIOLOGY:**9 Hours**

Prokaryotic and Eukaryotic cell- structure /organization. Cell organelles - ultra structure and function of chloroplast, mitochondria and nucleus. Cell division - mitosis and meiosis.

UNIT – 5: GENETICS AND PLANT BIOTECHNOLOGY:**9 Hours**

Mendelism - Law of dominance, Law of segregation, Incomplete dominance. Law of independent assortment. Monohybrid and dihybrid cross - Test cross - Back cross. Plant tissue culture - *In vitro* culture methods. Plant tissue culture and its application in biotechnology.

Text Books:

1. Singh, V., Pande, P.C and Jain, D.K. 2021. A Text Book of Botany. Rastogi Publications, Meerut.
2. Bhatnagar, S.P and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru.
3. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd. Delhi.
4. Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi.
5. Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany, S. Viswanathan Pvt. Ltd., Madras.

Reference books:

1. Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes - Surjeet Publications, Delhi.
2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd.
3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi.
4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi.
5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi.
6. Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surjeet Publications, Delhi.

7. Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I &II, S.Chand and Co. New Delhi.

Web Resources

1. <https://www.kobo.com/us/en/ebook/the-algae-world>
2. [http://www.freebookcentre.net/biology-books-download/Fungi-\(PDF-15P\).html](http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html)
3. <http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm>
4. <https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/>
5. <https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf>
6. <https://www.us.elsevierhealth.com/medicine/cell-biology>
7. <https://www.us.elsevierhealth.com/medicine/genetics>
8. <https://www.kobo.com/us/en/ebook/plant-biotechnology-1>

I B.Sc Zoology	ALLIED BOTANY PRACTICAL	ABZP11A
SEMESTER – I		HRS/WK –2
ALLIED/ ELECTIVE PRACTICAL		CREDIT –2

Objectives:

- To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of microorganisms, algae, and fungi
- To comprehend the fundamental concepts and methods used to identify Bryophytes, Pteridophytes and Gymnosperms through morphological changes and evolution, anatomy and reproduction.
- To be familiar with the basic concepts and principles of cell biology.
- Understanding of laws of inheritance, genetic basis of loci and alleles.
- To learn about the principles and applications of Biotechnology

EXPERIMENTS

1. Make suitable micro preparation of the types prescribed in Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.
2. Micro photographs of the cell organelles ultra structure.
3. Simple genetic problems.
4. Spotters - Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms Cell biology and Biotechnology.

Bonafide record of practical work done should be submitted for the practical examination Course outcomes:

On completion of this course, the students will be able to:

1. To study the internal organization of algae .
2. To study the structure and organization of fungi, bacteria and viruses
3. Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms.
4. To study the cell structure and function.
5. Understand the fundamental concepts of genetics and Biotechnology

Recommended texts

1. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi.
2. Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi.
3. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi.
4. Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York, England.
5. Noggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi.

Reference books

1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India.
2. Nancy Sereidiak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.
4. Aler Gingauz.2001. MedicinalChemistry.OxfordUniversityPress&WileyPublications.
5. Steward, F.C. 2012. Plant Physiology Academic Press, US

Web Resources

1. <https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883>
2. <https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gymnosperms&printsec=frontcover>
3. <https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4>

I B.Sc Zoology	BIOCOMPOSTING FOR ENTREPRENEURSHIP	NZO101
SEMESTER - I		HRS/WK – 2
SEC– I (NME)		CREDIT – 2

Objectives:

1. To highlight the importance of Biocomposting for entrepreneurship in waste management.
2. To enable students for setting up Biocompost units and bins for waste reduction.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To Gain knowledge about the process of Biocomposting.

CO2: To demonstrate Biocomposting techniques for various end applications like solid waste management, industrial waste recycling using sugarcane bagasse, etc.

CO3: To prepare Biocompost pit and bed

CO4: To describes Applications of Biocompost

CO5: To gain knowledge about the economic cost of establishing small Biocompost units as a cottage industry.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER I	COURSE CODE: NZO101					COURSE TITLE: BIOCOMPOSTING FOR ENTREPRENEURSHIP										HOUR S: 2	CRED ITS:2
	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)											
COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	4	4	4	5	5	5	3	4	4	4	5	4	4	4.3	
CO2	5	5	4	4	4	5	5	5	4	4	4	3	5	4	4	4.3	
CO3	5	5	4	4	4	5	5	5	4	4	4	3	5	4	4	4.3	
CO4	5	5	3	4	4	5	5	5	4	4	4	3	5	4	4	4.3	
CO5	5	5	3	4	4	5	5	5	4	4	4	3	5	4	4	4.3	
Mean Overall Score																4.3	

Result: The Score of this Course is 4.3 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I **6 Hours**
Biocomposting – Definition, types and ecological importance.

UNIT – II **6 Hours**

Types of Biocomposting technology – Field pits/ground heaps/ tank/large-scale/batch and continuous methods.

UNIT – III **6 Hours**

Preparation of Biocompost pit and bed using different amendments.

UNIT – IV **6 Hours**

Applications of Biocompost in soil fertility maintenance, promotion of plant growth, value added products, waste reduction, etc.

UNIT – V **6 Hours**

Economics of establishment of a small biocompost unit – project report proposal for Self Help Group (Income and employment generation).

Practical

- Preparation procedures for Biocompost pit.
- Selection of Biocompost material, separation of Compostable and Non-compostable materials.
- Packing and marketing of Biocompost.
- Field visit to Biocomposting unit.

References

1. Bikas R. Pati & Santi M. Mandal (2016). Recent trends in composting technology.
2. Van der Wurff, A.W.G., Fuchs, J.G., Raviv, M., Termorshuizen, A.J. (Editors) 2016. Handbook for Composting and Compost Use in Organic Horticulture. BioGreenhouse COST Action FA 1105, www.biogreenhouse.org.
3. S. Gajalakshmi, Indian Journal of Biotechnology Vol 3, October 2004, pp 486-494.
4. T. Ganesh kumar, Lambert Academic Publishing, 2013.
5. T. Ganesh kumar, Bioresources and Bioprocessing, 2014, 1:26.

I B.Sc Zoology	ORNAMENTAL FISH FARMING & MANAGEMENT	FZO101
SEMESTER - I		HRS/WK – 2
FC – I		CREDIT – 2

Objective:

1. To highlight the importance of ornamental fish culture in relation to entrepreneurship development.
2. To enable the identification, culture and maintenance of commercially important ornamental fishes.
3. To provide the knowledge on the techniques of ornamental fish breeding, rearing, disease control and economics of ornamental fish farming.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To identify, culture, maintain and market the commercially important ornamental fishes.

CO2: To understand the biology, food and feeding of egg layers and live bearers

CO3: To understand the aquarium construction and maintenance

CO4: To understand the economic condition of ornamental fishes

CO5: The knowledge and skills gained on the different aspects of ornamental fish keeping will enable the students to develop entrepreneurship potential and help in self employment.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER I	COURSE CODE: FZO101					COURSE TITLE: ORNAMENTAL FISH FARMING & MANAGEMENT										HOUR S: 2	CRED ITS:2
	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)											
COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	4	5	5	5	3	4	4	3	5	4	5	4.5	
CO2	5	5	4	5	4	5	5	5	3	4	4	3	5	4	5	4.4	
CO3	4	5	4	5	4	5	5	5	3	4	4	3	5	5	5	4.4	
CO4	4	5	4	5	4	5	3	3	4	4	4	3	5	4	5	4.1	
CO5	4	5	4	5	4	5	3	3	4	4	4	3	5	3	5	4.1	
Mean Overall Score																4.3	

Result: The Score of this Course is 4.3 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT I: 6 Hours

Introduction to ornamental fish keeping.
Scope and importance of ornamental fish culture.
Domestic and global scenario of ornamental fish trade and export potential.
Commercially important ornamental fishes - Indigenous and exotic varieties.

UNIT II: 6 Hours

Biology of egg layers and live bearers.
Food and feeding in ornamental fishes. Formulated feed and Live feed; Live feed culture.
Breeding, hatchery and nursery management of egg layers (eg. Goldfish) and live bearers (eg. Guppy).

UNIT III: 6 Hours

Aquarium design and construction; Accessories - aerators, filters and lighting.
Aquarium plants and their propagation.
Maintenance of aquarium and water quality management.
Ornamental fish diseases, their prevention, control and treatment methods.

Unit IV 6 Hours

Conditioning, packing, transport and quarantine methods.
Economics, trade regulations, domestic and export marketing strategies.

Practical 6 Hours

- 1) Identification of locally available ornamental fishes - Egg layers and live bearers.
- 2) Identification of locally available live feed organisms.

Text Books:

1. Arumugam N. 2008. Aquaculture, Saras Publication
2. Jayashree K.V., Tharadevi C.S. and Arumugam N. 2023. Ornamental Fish Farming and Management. Saras Publication.

References:

1. Swain SK., Sarangi N. and Ayyappan S. 2010. Ornamental fish farming. ICAR, New Delhi.
2. Living Jewels – A handbook on freshwater ornamental fish, MPEDA, Kochi.
3. Dey V.K.A. 1997. A handbook on aquafarming ornamental fishes. MPEDA, Kochi.
4. Ahilan, B., Felix N. and Santhanam R. 2008. Text book of aquariculture. Daya Publishing House, New Delhi.

Web links:

1. <http://ecoursesonline.iasri.res.in/course/view.php?id=297>
2. <https://www.ofish.org/>
3. <https://krishijagran.com/agripedia/income-generation-by-ornamental-fish-culture/>
4. <https://99businessideas.com/ornamental-fish-farming/>

I B.Sc Zoology	CHORDATA-I	19ZO203
SEMESTER - II		HRS/WK – 4
CORE – II		CREDIT – 3

Objective:

To acquire knowledge on classification of chordates and their characteristic features

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To describes the general characters and affinities of Cephalochordata

CO2: To know the general characters and affinities of Hemichordata

CO3: To understand the general characters and affinities of Urochordata

CO4: To describes the salient features and classification of Phylum chordata and their origin

CO5: To know classification of phylum Pisces, Accessory respiratory organs and Migration in fishes

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER II	COURSE CODE: 19ZO203					COURSE TITLE: CHORDATA-I										HOUR S: 4	CRED ITS:3
	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)											
COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	4	4	4	5	5	5	3	4	4	4	5	4	4	4.3	
CO2	5	5	4	4	4	5	5	5	4	4	4	3	5	4	4	4.3	
CO3	5	5	4	4	4	5	5	5	4	4	4	3	5	4	4	4.3	
CO4	5	5	3	4	4	5	5	5	4	4	4	3	5	4	4	4.3	
CO5	5	5	3	4	4	5	5	5	4	4	4	3	5	4	4	4.3	
Mean Overall Score																4.3	

Result: The Score of this Course is 4.3 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I

12 Hours

Sub phylum: Prochordata: General Characters -**Type study: Amphioxus** (Cephalochordata) – Morphology, Wheel organ, feeding mechanism- Affinities with invertebrates and chordates

UNIT –II

12 Hours

Sub phylum: Prochordata: Type study: Balanoglossus (Hemichordata) General Characters and Chordate features - Affinities with Urochordata, Amphioxus, Prochordata

UNIT – III

12 Hours

Sub phylum: Prochordata: Type study: Ascidian: General Characters – Morphology and affinities with Urochordata and cephalochordata – Ascidian Tadpole larva – retrogressive metamorphosis.

UNIT – IV

12 Hours

Salient Features and General classification of Phylum chordate upto orders. Origin of Chordates – theories proposed about chordata –Coelenterate theory, nemertean theory, annelid theory, insect theory and echinoderm theory.

UNIT – V

12 Hours

Class PISCES General characters and classification upto orders. **Type study: Shark.** Morphology- digestive system, respiratory system, reproductive system -Accessory respiratory organs in fishes, Migration in fishes.

Text Books:

1. EkambaranathaAyyar, M and T.N Anantha Krishnan 1992, A manual of zoology Vol. II [Chordata]. S. Viswanathan [Printers and publishers] Pvt. Ltd., Madras.
2. Jordan E. L. and P.S. Verma 1995. Chordate Zoology and elements of Animal Physiology. S. Chand and co., New Delhi.
3. Kotpal R.L. 1992. Vertebrata, Rastogi publication, Meerut.

Reference Books:

1. Nigam. H.C 1983 Zoology of chordates, Vishal publications, Jalandhar.
2. Waterman, Allyn J.et al. 1971, Chordate Structure and functions, Mac. Millan and co., New York.
3. Jollie. M. 1968. Chordate Morphology. East west press Pvt. Ltd., New Delhi.
4. Hyman. L.H. Comparative vertebrate zoology. McGraw Hill co. New York

I B.Sc Zoology	CHORDATA-II	19ZO204
SEMESTER - II		HRS/WK – 4
CORE – III		CREDIT – 3

Objective:

To impart peculiar characteristics of prochordates, amphibians, snakes, birds and mammals.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To classify phylum Amphibia and explain their adaptive features and parental care

CO2: To classify the phylum Reptilia and biting mechanism of poisonous snakes

CO3: To describe the phylum Aves and migration and flight adaptation in birds

CO4: To understand the Phylum Mammalia and egg laying mammals

CO5: To understand the Origin of Primates and adaptations of aquatic mammals

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER II	COURSE CODE: 19ZO204					COURSE TITLE: CHORDATA-II										HOUR S: 4	CRED ITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	4	5	5	5	3	4	4	3	5	4	5	4.5	
CO2	5	5	4	5	4	5	5	5	3	4	4	3	5	4	5	4.4	
CO3	4	5	4	5	4	5	5	5	3	4	4	3	5	5	5	4.4	
CO4	4	5	4	5	4	5	3	3	4	4	4	3	5	4	5	4.1	
CO5	4	5	4	5	4	5	3	3	4	4	4	3	5	3	5	4.1	
Mean Overall Score															4.3		

Result: The Score of this Course is 4.3 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I

12Hours

CLASS AMPHIBIA General characters and classification upto orders. **Type study :Frog** – morphology, digestive system, respiratory system, urinogenital system, sexual dimorphism, life cycle - Adaptive features of Anura, Urodela&Apoda. Parental care in Amphibia – Neoteny.

UNIT –II

12Hours

CLASS REPTILIA- General characters and classification upto orders.**Type study – Calotes:** morphology, digestive system, respiratory system, urinogenital system -Poison apparatus and biting mechanism of poisonous snakes. Conservation of turtles and crocodiles.

UNIT – III

12Hours

CLASS AVES - General characters and classification upto orders. Features of Archaeopteryx **Type study –Pigeon:** morphology, digestive system, respiratory system, urinogenital system.Migration in birds, Flight adaptation.

UNIT – IV

12Hours

CLASS MAMMALIA - General characters and classification upto orders. Egg laying mammals **Type study – Rabbit:** morphology, digestive system, respiratory system, urinogenital system. Dentition in mammals.

UNIT – V

12Hours

PRIMATES- General characters, classification - **Origin of Primates** - **Type study** – Lemurs – digestive system, respiratory system, urinogenital system - adaptations of aquatic mammals

Text Books:

1. EkambaranathaAyyar, M and T.N Anantha Krishnan 1992, A manual of zoology Vol. II [Chordata]. S. Viswanathan [Printers and publishers] Pvt. Ltd., Madras.
2. Jordan E. L. and P.S. Verma 1995. Chordate Zoology and elements of Animal Physiology. S. Chand and co., New Delhi.
3. Kotpal R.L. 1992. Vertebrata, Rastogi publication, Meerut.

Reference Books:

1. Nigam. H.C 1983 Zoology of chordates, Vishal publications, Jalandhar.
2. Waterman, Allyn J.et al. 1971, Chordate Structure and functions, Mac. Millan and co., New York.
3. Jollie. M. 1968. Chordate Morphology. East west press Pvt. Ltd., New Delhi.
4. Hyman. L.H. Comparative vertebrate zoology. McGraw Hill co. New York

I B.Sc Zoology	CORE PRACTICAL – II CHORDATA	ZOP202
SEMESTER – II		HRS/WK – 3
CORE PRACTICAL – II		CREDIT – 2

DISSECTIONS

Fish – Digestive system

MINOR PARCTICAL

Shark - Placoid scales

SPOTTERS

Study of the following specimens

1. Classify by giving reasons

Amphioxus, Shark, Hyla, Rhacophorus, Calotes, Pigeon, Rat/Rabbit.

2. Adaptations to their respective modes of life

Balanoglossus, Ascidian, Ichthyophis, Draco, sea snake and Bat.

3. Biological significance:

Anabas, Hippocampus, Narcine, Echeneis, Arius, Exocoetus, Eel, Amblystoma, Axolotl Larva, Bufo, Cobra, Krait, Russels Viper, EchisCarinata, Turtle, Parrot, Woodpecker, King Fisher and Ant eater

4. Relate structure and function:

Ctenoid Scale and Quill Feather of pigeon.

5. Draw labeled sketches:

T.S. of Amphioxus through Pharynx.

6. Osteology

Skeleton - Pectoral girdles of Frog and Pigeon., Pelvic Girdles of Frog and Pigeon.

Fore and Hind limbs of Frog and Pigeon., Synsacrum of Pigeon. **Dentition** - Dog, Rabbit and Man.

Reference Books:

1. Verma. P.S. 2011 A Manual of Practical Zoology CHORDATES, Chand & co, Ltd. Ram Nagar – New Delhi.
2. JayanpaSinha . 2010 Advanced Practical Zoology, Books & Allied (p) Ltd. No.1. Subham Plaza IFloor, Calcutta.

I B.Sc Zoology	EFFECTIVE ENGLISH	EFE202
SEMESTER – II		HRS/WK - 2
PART – IV SDC		CREDIT- 2

Objectives:

1. To develop the communication ability of the students with focus on ‘Speaking Skill’ enabling them to use the language more effectively and confidently
2. To widen the student’s grasp of vocabulary and enable them to use these words in appropriate contexts.

Course Outcomes (CO’s):

At the end of the course students exhibit

CO1: Ability to start a conversation, interrogate, apologise or request appropriately in various context.

CO2: Ability to read and interpret, converse over telephone.

CO3: Display use of rich vocabulary and coin words.

CO4: Develop oratorical skills

CO5: Decode the patterns of language behaviour to describe, narrate or summarise a paragraph.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER II	COURSE CODE: EFE202					COURSE TITLE: EFFECTIVE ENGLISH										HOUR S: 2	CRED ITS:2
	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)											
COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	4	4	5	3	3	5	5	2	5	2	4	4.1	
CO2	5	5	5	5	4	4	5	3	3	5	5	3	5	2	4	4.2	
CO3	5	5	5	4	4	4	5	3	3	5	5	2	5	2	4	4.1	
CO4	4	5	4	4	4	4	5	3	3	5	5	2	5	2	4	4.0	
CO5	5	5	4	5	4	4	5	3	3	5	5	3	5	2	4	4.1	
Mean Overall Score																4.1	

Result: The Score of this Course is 4.1 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH association** with Programme Outcome and Programme Specific Outcome

Session 1 Breaking the Ice

- Greeting People
- Discussing Current Events
- Talking about different situations

Session 2 Background

- Talking about events in life
- Discussing past events
- Talking about your education

Session 3 Achievement

- Talking about experiences •
- Discussing progress toward goals
- Talking about competition

Session 4 News

- Discussing news stories
- Discussing recent events
- Talking about memories

Session 5 Virtual World

- Discussing purposes and reasons
- Understanding common technology terms
- Writing emails

Session 6 On the Move

- Discussing travel procedures
- Talking about frequency
- Talking about travel problems

Session 7 Planning

- Making arrangements
- Describing arrangements
- Discussing plans and decisions

Session 8 Predictions

- Discussing predictions
- Describing the climate
- Discussing forecasts and scenarios

Session 9 Buying and Selling

- Talking about purchasing
- Discussing advantages and disadvantages
- Making comparisons

Session 10 Leisure Time

- Talking about leisure
- Discussing likes and dislikes
- Discussing feelings about experiences

Session 11 Lifestyle

- Talking about time
- Giving advice
- Discussing imaginary scenarios

Session 12 Forces of Nature

- Discussing the natural environment
- Describing systems
- Describing position and movement

Session 13 On the Road

- Talking about cars and roads
- Explaining rules
- Discussing rental arrangements

Session 14 Fashion Sense

- Describing things relatively
- Describing clothing
- Discussing safety issues

Session 15 In Control

- Talking about electrical devices
- Understanding technical instructions
- Describing controlling actions

Text books

http://kb.naanmudhalvan.in/images/c/c7/Cambridge_Course_Details.pdf

References

http://kb.naanmudhalvan.in/images/c/c7/Cambridge_Course_Details.pdf

II B.Sc Zoology	CELL BIOLOGY	19ZO305
SEMESTER – III		HRS/WK – 4
CORE – IV		CREDIT – 3

Objective:

1. Have an enhanced knowledge on microscopes, cytological techniques.
2. To provide a basic information on structure and functions of cell and cell organelles

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To understand the Principles of microscopes and Cytological techniques

CO2: To describe the Cell theory, Ultra structure of animal cell

CO3: To recognize the properties of cytoplasm and Ultra structure of nucleus.

CO4: To explain the structure and functions cell organelles

CO5: To obtain knowledge on cell cycle and cell division

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER III	COURSE CODE: 19ZO305					COURSE TITLE: CELL BIOLOGY										HOURS: 4	CRE DITS :3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	4	5	5	5	5	5	5	5	5	2	5	4.7	
CO2	5	5	5	5	4	5	5	4	5	5	5	4	5	2	5	4.6	
CO3	5	5	5	5	4	5	5	5	5	5	5	4	5	2	5	4.7	
CO4	5	5	4	5	4	5	5	4	5	5	5	3	5	2	5	4.5	
CO5	5	5	5	5	4	5	5	4	5	5	5	4	5	2	5	4.6	
Mean Overall Score															4.6		

Result: The Score of this Course is 4.6 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I**12 Hours**

HISTORY OF CELL– Principles of microscopes: light and electron, **Cytological techniques** - cell fractionation, Homogenization, Centrifugation, Isolation of Sub-cellular components – Fixation- Sectioning-Staining

UNIT – II**12 Hours**

CELL – Cell theory, Ultra structure of animal cell – structure, composition and functions – cell components – Plasma Membrane-permeability, fluid mosaic theory, bilayer model, sandwich model – Endoplasmic reticulum- rough and smooth endoplasmic reticulum.

UNIT – III**12 Hours**

CYTOPLASM – Physical, chemical and biological properties. **Nucleus** – Ultrastructure, Composition and Function – nucleolus: structure, types and functions.

UNIT – IV**12 Hours**

RIBOSOMES- structure and function, Golgi Complex- structure and function, Lysosomes: structure and function -suicidal bag, Glyoxisomes, peroxisomes, centrioles: structure and function and Mitochondria- structure and function, cell respiration.

UNIT – V**12 Hours**

CELL CYCLE AND CELL DIVISION – Amitosis, Mitosis- Prophase, metaphase, anaphase, telophase- and meiosis Prophase-leptotene, zygotene, pachytene, diplotene and diakinesis- metaphase, anaphase, telophase and their significance.

Text Books:

1. Powar, C.B.,1989.Essentials of Cytology, Himalaya Publishing House, Bombay.
2. Verma, P.S., and V.K. Agarwal, 1995. Cell and Molecular Biology, 8th Edition, S. Chand & Co., NewDelhi.
3. Rastogi. S.C. 2008 Cell and Molecular Biology, 2nd Edition, New Age International (p) Ltd., New Delhi

Reference Books:

1. Cohn, N.S., 1979, Elements of Cytology, Freeman Book co., New Delhi.
2. De Robertis, E.D.P. and E.M.F. De Robertis, 1988. Cell and molecular Biology, 8th Edition, International edition Informes Hongkong. 734p.
3. Gies, A.C., 1979. Cell Physiology, Saunders co., Philadelphia, London, Toronto.
4. Jayanthi .G.P. 2009 Molecular Biology, M.J.P Publ. Chennai.

II B.Sc Zoology	MOLECULAR BIOLOGY	19ZO306
SEMESTER - III		HRS/WK – 4
CORE – V		CREDIT – 3

Objective:

Expose the students to the incipient field of research in molecular biology by providing basic knowledge on biochemical and cell culture techniques and cancer biology

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To get knowledge on biochemical and cell culture techniques

CO2: To know chromosomes structure and giant chromosomes.

CO3: To understand the structure and function of DNA and types of RNA.

CO4: To realize cancer biology and process of aging

CO5: To describe the mechanism of DNA replication and Protein synthesis

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER III	COURSE CODE: 19ZO306					COURSE TITLE: MOLECULAR BIOLOGY										HOURS: 4	CRE DITS :3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	4	4	5	3	5	5	4	4	5	2	5	4.4	
CO2	5	5	5	4	4	4	5	3	5	5	4	3	5	2	5	4.3	
CO3	5	5	4	3	4	4	5	3	5	5	4	2	5	2	5	4.1	
CO4	5	5	5	4	4	4	5	3	4	5	4	2	5	2	5	4.1	
CO5	5	5	5	4	4	4	5	3	5	5	4	4	5	2	5	4.3	
Mean Overall Score																4.2	

Result: The Score of this Course is 4.2 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I

12Hours

BIOCHEMICAL TECHNIQUES – Electrophoresis – types of electrophoresis: Paper Electrophoresis, Agarose gel electrophoresis, PAGE, SDS-PAGE, PFGE, 2D electrophoresis - applications of Electrophoresis. **Cell culture techniques and applications.**

UNIT – II

12Hours

CHROMOSOMES: structure and function, Types of chromosome– Heterochromatin: structure, types and function, Euchromatin: structure and function - **Giant chromosomes:** Polytene and Lamp brush chromosomes.

UNIT – III

12Hours

dna: Structure - Watson and Crick Model of DNA – Chemical composition and functions of DNA. **RNA:** Types- Structure and functions of Messenger RNA, Structure and functions of Transfer RNA, Structure and functions of Ribosomal RNA.

UNIT – IV

12Hours

CANCER BIOLOGY – structure of cancer cell, characteristics of cancer, properties of cancer cells, types of cancer, causes of cancer, carcinogenesis. **Aging** – theories of aging, Cell death- Necrosis and Apoptosis.

UNIT – V

12Hours

DNA REPLICATION – Types, Enzymology and Mechanism, Semi conservative replication. **Protein synthesis:** Mechanism-Transcription-Translation-Post translation.

Text Books:

1. Verma, P.S., and V.K. Agarwal, 1995. Cell and Molecular Biology, 8th Edition, S. Chand & Co., New Delhi.
2. Rastogi. S.C. 2008 Cell and Molecular Biology, 2nd Edition, New Age International (p) Ltd., New Delhi.

Reference Books:

1. Cohn, N.S., 1979, Elements of Cytology, Freeman Book co., New Delhi.
2. De Robertis, E.D.P. and E.M.F. De Robertis, 1988. Cell and molecular Biology, 8th Edition, International edition Informes Hongkong. 734p.
3. Gies, A.C., 1979. Cell Physiology, Saunders co., Philadelphia, London, Toronto.
4. Jayanthi .G.P. 2009 Molecular Biology, M.J.P Publ. Chennai.

II B.Sc Zoology	GENETICS	19ZO407
SEMESTER - IV		HRS/WK – 4
CORE – VI		CREDIT – 3

Objective:

To provide basic knowledge in the field of genetics and applications of modern genetics.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To acquire basic information on genetics and Mendelian laws

CO2: To understand multiple alleles and pedigree analysis in human traits.

CO3: To define linkage and crossing over.

CO4: To describe non-disjunction and gynandromorphs and fine structure of gene

CO5: To acquire knowledge on mutation, applied genetics and population genetics

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER IV	COURSE CODE: 19ZO407					COURSE TITLE: GENETICS										HOUR S: 4	CRED ITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	4	4	5	3	3	5	5	2	5	2	4	4.1	
CO2	5	5	5	5	4	4	5	3	3	5	5	3	5	2	4	4.2	
CO3	5	5	5	4	4	4	5	3	3	5	5	2	5	2	4	4.1	
CO4	4	5	4	4	4	4	5	3	3	5	5	2	5	2	4	4.0	
CO5	5	5	4	5	4	4	5	3	3	5	5	3	5	2	4	4.1	
Mean Overall Score																4.1	

Result: The Score of this Course is 4.1 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I

12Hours

Introduction to genetics – Basis of Mendelian Inheritance and Mendelian Laws – mendel's experiment-monohybrid and dihybrid cross- Interaction of Genes – Complementary Factors, Inhibitory and lethal Factors -Atavism.

UNIT-II

12Hours

Multiple Alleles – Blood Groups and their Inheritance in man- ABO Blood group inheritance, Rh factor. **Pedigree analysis** in human traits- uses of pedigree analysis.

UNIT – III

12Hours

Linkage-definition, types, linkage in Drosophila and **crossing over** -definition, types of crossing over Drosophila – Morgan's Experiments - Cytological Evidence for Crossing Over.**Sex determination and sex linkage** in Drosophila and Man.

UNIT – IV

12Hours

Non – Disjunction and Gynandromorphs– Cytoplasmic Inheritance Maternal effect on Limnaea [shell coiling], **Fine Structure of Gene** – Cistron –Recon, Muton – **Gene Regulation** – Operon concept – Lac Operon.

UNIT – V

12Hours

Mutation – chromosomal Aberrations – examples from Human.**Applied Genetics** – Animal Breeding – Heterosis, Inbreeding, Out breeding, Out Crossing, Hybrid Vigour. **Population Genetics:** Hardy Weinberg Law – factors affecting Hardy Weinberg Law.

Text Books:

1. Verma, P.S. and V.K. Agarwal, 1995 Genectis, 8th edition, S. Chand & Co, New Delhi.
2. Veer BalaBastogi, 2019 Genetics, Medtech Publishers

Reference Books:

1. Gunther S. Stent 1986. Molecular Genetics. Macmillan Publishing Co Inc.
2. Gardener. 1991. Principles of Genetics. 8th edition. John wiley& sons Inc. New York. Chichester,Brisbane, Toronto, Singapore.
3. Monroe. W. Strick Berger 2004 Genetics. Printice Hall of India New Delhi.
4. Nicholls. 2002 Genetic Engineering, Cambridge University Press. UK.

II B.Sc Zoology	BIOTECHNOLOGY	19ZO408
SEMESTER – IV		HRS/WK – 4
CORE – VII		CREDIT – 3

Objective:

1. To generate potential knowledge regarding the scope and applications of biotechnology.
2. To understand the modern biotechnology practices and approaches with highlighting in genetic engineering , rDNA technology, cloning and gene transfer technology

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To know the scope and applications of biotechnology

CO2: To acquire knowledge on techniques of genetic engineering and rDNA technology.

CO3: To realise gene cloning in prokaryotes and basics of human genome project.

CO4: To describe transgenic plants and animals

CO5: To understand the application of recombinant DNA technology

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER IV	COURSE CODE: 19ZO408					COURSE TITLE: BIOTECHNOLOGY										HOUR S: 4	CRED ITS:3
	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)											
COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	4	3	5	1	3	4	4	3	4	3	5	4.0	
CO2	5	5	5	5	4	3	5	2	3	4	4	4	4	4	5	4.1	
CO3	5	5	4	5	4	3	5	2	4	4	4	4	4	4	5	4.1	
CO4	5	5	5	5	4	3	5	2	4	4	4	4	4	4	5	4.2	
CO5	5	5	5	5	4	3	5	2	4	4	4	4	4	3	5	4.1	
Mean Overall Score																4.1	

Result: The Score of this Course is 4.1 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I**12Hours**

Definition – Scope and applications of Biotechnology – isolation of DNA – types of DNA extraction methods – cloning – Tools of Genetic Engineering: Enzymes, Linkers and Adaptors.

UNIT-II**12Hours**

Cloning vectors: requirements of a cloning vector, types [plasmids, pBr322, Phage I, Cosmids and phagemids]. Techniques of Genetic Engineering - recombinant DNA Technology.

UNIT-III**12Hours**

Gene Cloning in prokaryotes, **cDNA- Genomic Library**, construction and uses. Human genome project: Genome and its significance, techniques of Human Genome Project, Potential benefits of Human genome projects .

UNIT – IV**12Hours**

Transgenic plants and animals – Production of Transgenic plant (Bt. Cotton) and transgenic animal (mice), Applications of Transgenic animals. .DNA finger printing and its applications– gene therapy – biosensors and its applications – biochips and its applications

UNIT-V**12Hours**

Application of Recombinant DNA technology in Medicine and Agriculture – Application of biotechnology in environmental protection – Socio economic issues of Biotechnology in India

Text Books:

1. Dubey, R.C 2006 Text Book of Biotechnology S. Chand & co. New Delhi.
2. Kumar H. D. 1998 A text book of Biotechnology, affiliated East West pvt. Ltd., New Delhi.

Reference Books:

1. Higgins II, Best GJ and Jones J 1996 Biotechnology – Principles and application Black well scientific Publication Oxford London.
2. Gupta, P.K. 2001 Elements of Biotechnology Rastogi publication, Meerut.
3. Vijayaraman, Chellammal K.S and Manikkili. P 1998. UyiriyaeThozhilnutpam. Chimeeraa, Trichy.

II B.Sc Zoology	CORE PRACTICAL – II CELL AND MOLECULAR BIOLOGY, GENETICS AND BIOTECHNOLOGY	CODE: 19ZOP42
SEMESTER – III & IV		HRS/WK – 3
CORE PRACTICAL – III		CREDIT – 4

CELL AND MOLECULAR BIOLOGY

Cytometry

Compound microscope, Camera Lucida, Stage and Ocular Micrometers

Blood Smear Preparation – Differential count of W.B.C.

Total count of RBC using Haemocytometer.

Total count of WBC using Haemocytometer.

Slide Preparation

Buccal Smear.

Mitosis in onion root tip squash.

Squash preparation of Grass hopper testes.

Study of prepared slides of histology.

Columnar Epithelium, Ciliated epithelium, Glandular Epithelium. Cartilage T.S., Bone T.S., Cardiac Muscle, Striated muscle, Non Striated muscle, Neuron, C.S of mammalian Testis and Ovary.

GENETICS

Squash preparation of Salivary glands of chironomous larva (Giant chromosome).

Male & Female identification of Drosophila.

Observation of common Mutants of Drosophila.

Human Blood Grouping.

BIOTECHNOLOGY

Study of prepared slides, Models or specimen.

Escherichia coli, Bacteriophage, Plasmid.

Demonstration of P.C.R technique: Southern blot, Electrophoresis.

Visit to Biotechnology lab and Report – compulsory.

II B.Sc Zoology	OFFICE FUNDAMENTALS	CODE:ZOOF403
SEMESTER – IV		HRS/WK-2
SDC		CREDIT – 2

Objective:

To know the fundamentals of MS-Word, MS-Excel and MS-PowerPoint.

Course Outcomes:

CO1: To Understand the Basic concepts of MS-Office Packages – MS-Word.

CO2: Ability to format text, and paragraphs in MS-Word..

CO3: To Understand the basic usage of MS-Office Packages – MS-Excel

CO4: Ability to format cells using spreadsheet.

CO5: To Understand the basic usage of MS-Office Packages – MS-PowerPoint

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER IV	COURSE CODE: ZOOF403					COURSE TITLE: OFFICE FUNDAMENTALS										HOURS: 2	CRE DITS :2
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5	
CO2	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5	
CO3	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5	
CO4	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5	
CO5	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5	
Mean Overall Score																4.5	

Result: The Score of this Course is 4.5 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT- I: 6 Hours

Introduction to Word: Introduction to Word Processing, Advantages of word processing, Creating, Saving, Editing and Printing a document: Selecting, Deleting, Replacing Text, Copying text to another file.

UNIT- II: 6 Hours

Formatting Text and Paragraph: Using the Font Dialog Box, Paragraph Formatting using Bullets and Numbering in Paragraphs, Checking Spelling, Line spacing, Margins, Space before and after paragraph.

UNIT- III: 6 Hours

Introduction to Excel: Introduction to spreadsheet, creating, editing, saving, and printing spreadsheets, entering information: Numbers, Formula, Editing Data in a cell, Filtering Data, using a Range with SUM, Excel functions, Modifying worksheets with color & auto formats.

UNIT- IV: 6 Hours

Formatting cells: Moving and copying data, Inserting and Deleting Row and columns in the worksheet, Using the format cells Dialog box, using chart wizard to create a chart, Securing & Protecting spreadsheets.

UNIT- V: 6 Hours

Introduction to Power Point: Introduction of slide presentation- Presentations Creating, Manipulating & Enhancing Slides-Organizational Charts- Inserting clip Arts, Adding Objects- formatting and checking text.

TEXT BOOKS:

1. Computer Basics with Office Automation, by Dr. Archana Kumar, Product information Publisher Dreamtech Press (1 January 2019)
2. Computer Fundamentals and Office Automation, by Dr.R. Deepalakshmi, Charulatha Publications Private Limited (1 January 2019)
3. Microsoft Office 2007 Bible. , John Walkenbach, Herb Tyson, Cary N.Pr, Faithe Wempen, John Wiley & Sons publications, 2007.

REFERENCE BOOKS:

1. "Microsoft Office 2007, Will Train, Gini Corter, Annette Marquis" BPB publications, 2007
2. "PC Software for Windows 98, Made Simple R. K. TAXALI " TMH publications, 2001
3. "MS Office 2000 for every one", Sanjay Saxena, Vikas Publishing House PVT LTD, 2000.
4. Office Automation, by Girija D. K. -Rashmi M. -Shilpa H.K. , Himalaya Publishing House Pvt Ltd, 2022
5. "Computer Basics with Office Automation", by Archana Kumar, I K International Publishing House Pvt. Ltd , 30 December 2013

III B.Sc Zoology	BIostatistics and Computational Biology	20ZO509
SEMESTER – V		HRS/WK – 5
CORE – VIII		CREDIT – 4

Objective:

1. To learn basics of Biostatistics and their application in biology
2. To acquire knowledge on Computational Biology

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To acquire knowledge on scope and sampling methods in biostatistics

CO2: To understand the measure of central tendency and measures of dispersion.

CO3: To understand types of computers, operating systems and its applications

CO4: To acquire knowledge on biological databases like NCBI, GenBank etc.

CO5: To gain knowledge on DNA and RNA sequencing

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER V	COURSE CODE: 20ZO509					COURSE TITLE: BIostatistics and Computational Biology										HOURS: 5	CREDITS: 4
	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)											
COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	4	5	4	5	5	4	5	5	4	1	5	2	5	4.3	
CO2	5	5	4	5	4	5	5	3	5	5	4	1	5	2	5	4.2	
CO3	5	5	4	5	4	4	5	2	5	5	4	2	5	4	5	4.3	
CO4	5	5	4	5	4	5	5	3	4	5	4	1	5	2	5	4.1	
CO5	5	5	4	5	4	4	5	3	4	5	4	1	5	1	5	4.0	
Mean Overall Score																4.2	

Result: The Score of this Course is 4.2 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

BIOSTATISTICS

UNIT – I

15 Hours

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

UNIT – II

15 Hours

Measures of central tendency: mean, median and mode. Measures of Dispersion, Range, Quartile deviation, mean deviation and Standard deviation. Test of significance - Student's 't'-Test.

COMPUTATIONAL BIOLOGY

UNIT – III

15 Hours

Introduction – computer – types of modern computers – operating systems – applications of MS-WORD, MS-EXCEL and MS-PPT- Documentation and Presentation of Bio Statistical data– Browsers – search engines - Use of Internet, Messenger and E-mail – Basic Knowledge of Medical transcription.

UNIT- IV

15 Hours

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

UNIT – V

15 Hours

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

Text Books:

1. Gupta SP 1996. Statistics –S. Chand and Co., New Delhi.
2. Christine Solomon. MS. OFFICE for Win – Microsoft office press. Developing Application with MS-OFFICE – Microsoft Office Press.

Reference Books:

1. Jerold H. Zar 1984. Bio Statistical analysis [2nd edition] printice Hall of International edition.
2. Goutham Roy 2002. Introduction to Computing and computing lab and Cad Books and allied [pvt]ltd. Kolkata.
3. Cynthia Gibbs. Developing Bioinformatics Computer Skills. Sheoff Publishers & Distributors Pvt.Ltd., Mumbai.
4. Arthur. M. Lesk 2003. Introduction to Bioinformatics, Oxford University Press, New Delhi.
5. Arthur. M. Lesk, Introdution to protein Structures Oxford University Press, New Delhi, 2000
6. Baxevanis, A and Outllette 2005. Bioinformatics a practical guide to the analysis of genes and proteins, Willy – Interscience, Hoboken, NJ. USA.

III B.Sc Zoology	DEVELOPMENTAL BIOLOGY & IMMUNOLOGY	20ZO510
SEMESTER – V		HRS/WK – 5
CORE – IX		CREDIT – 4

Objective:

1. To learn basic concepts of developmental biology and artificial reproductive technology
2. To acquire knowledge on immune system and immune deficiency diseases

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To acquire knowledge on gametogenesis and parthenogenesis

CO2: To understand the process of cleavage and blastulation.

CO3: To realize embryonic adaptation and artificial reproductive technology.

CO4: To describe lymphoid organ and immune system

CO5: To gain information regarding immunoglobulin and immune deficiency diseases

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER V	COURSE CODE: 20ZO510					COURSE TITLE: DEVELOPMENTAL BIOLOGY & IMMUNOLOGY										HOURS: 5	CREDITS: 4
	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)											
COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	4	5	4	5	5	4	5	5	4	1	5	2	5	4.3	
CO2	5	5	4	5	4	5	5	3	5	5	4	1	5	2	5	4.2	
CO3	5	5	4	5	4	4	5	2	5	5	4	2	5	4	5	4.3	
CO4	5	5	4	5	4	5	5	3	4	5	4	1	5	2	5	4.1	
CO5	5	5	4	5	4	4	5	3	4	5	4	1	5	1	5	4.0	
Mean Overall Score																4.2	

Result: The Score of this Course is 4.2 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

DEVELOPMENTAL BIOLOGY

UNIT – I

15 Hours

Gametogenesis – Fertilization - polarity & symmetry of eggs – types of eggs – Fertilization Mechanism, Physiology & theories – parthenogenesis –Natural – artificial – Experiments on Artificial Parthenogenesis.

UNIT – II

15 Hours

Cleavage – Factors influencing cleavage – fate map – blastulation and gastrulation in amphioxus, frog and chick – Experimental works of Speeman and Mangold- Development of brain and eye in frog.

UNIT – III

15 Hours

Embryonic adaptations; Embryonic membranes and their functions in chick – placentation in mammals. Puberty – Menstrual cycle-contraception – family welfare reproductive technology; Artificial insemination - cryopreservation - IVF - Embryotransfer – Test tube babies – Bioethics.

IMMUNOLOGY

UNIT- IV

15 Hours

Introduction - **Lymphoid organs**, cells of immune system – their role in immune response.Types of immunity – their role in parasitic, bacterial & Viral Infection, in hyper – sensitivity and graft rejection. –Antigen – Antibody reaction.

UNIT – V

15 Hours

Immunoglobulin – types, structure, Physico chemical and biological properties – Immunoprophylaxis – Immunization schedule of children. Immuno deficiency – AIDS, Immunotechniques.

Text Books:

1. M.S.Jayaraj An Introduction to embryology Veer Bala Rastogi Publication.
2. Verma, P.S., V.K. Agarwal and Tyagi, 1995. Chordate embryology. S. Chand & co., New Delhi.

Reference Books:

1. Balinsky, B.L., Introduction to embryology 1981.Saunders, Philadelphia.
2. Berril & Corp Developmental Biology. McGraw Hill Book Company, MC.,New York.
3. Majumdar, N.N. 1990. Text Book of Vertebrate embryology. Tata McGraw – hill Publishing company Ltd. New Delhi.
4. McEwen, R.S., 1969.Vertebrate Embryology. Oxford and IBH Publishing Co., New Delhi.
5. Jain, P.C 1998, Elements of Developmental Biology. Vishal Publication, New Delhi.
6. Roitt.I.M 2000 Essential Immunology, Blackwell Scientific Publishers.
7. Paul, W.E.M. 1989,Fundamental Immunology, Raven Press, New York.
8. Kuby. J.1999, Immunology. W. H. Free man and Co. New York.
9. Current protocols in Immunology – 3 Volumes 1994 Wiley Publications.
10. Roitt. I, Brostoff, J. and Male. D. 2002. Immunology, Mosby, New York.
11. Richard, A. Golds, Thomas I, Kindt & Barbara A. Osborne 2000 Kuby Immunology, Freeman and Co.New York.

III B.Sc Zoology	ANIMAL PHYSIOLOGY	20ZO511
SEMESTER – V		HRS/WK – 5
CORE – X		CREDIT – 4

Objective:

To impart an overview of basic physiological functions of various organ system in human.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To describe the process of nutrition and digestion

CO2: To understand the process of respiration and circulation.

CO3: To recognize excretory system and osmo-ionoregulation in fishes and mammals.

CO4: To describe nervous system and muscular system

CO5: To understand receptors and structure, secretions and functions of endocrine glands

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER V	COURSE CODE: 20ZO511					COURSE TITLE: ANIMAL PHYSIOLOGY										HOU RS: 5	CRE DITS :4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	4	4	4	5	5	4	4	5	4	1	5	1	5	4.1	
CO2	5	5	4	4	4	5	5	4	4	5	4	3	5	1	5	4.2	
CO3	5	5	4	4	4	5	5	4	4	5	4	1	5	1	5	4.1	
CO4	5	5	4	4	4	5	5	4	4	5	4	1	5	1	5	4.1	
CO5	5	5	4	4	4	5	5	4	4	5	4	2	5	1	5	4.1	
Mean Overall Score																4.1	

Result: The Score of this Course is 4.1 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I**15 Hours****NUTRITION AND DIGESTION**

Introduction– Food requirements – Carbohydrates, proteins, fats, minerals, and vitamins. Digestive enzymes and their role in digestion – absorption and assimilation.

UNIT – II**15 Hours****RESPIRATION AND CIRCULATION**

Introduction – Respiratory Pigments and functions. Transport of gases [Co₂ and O₂] – Respiratory quotient. Circulation Types, Composition, Properties and Function of Blood – Human – Cardiac Cycle – Cardiac Rhythm – Origin of heart Beat – Regulation of heart Beat – ECG – Blood Pressure – Factors Contributing to heart Problems – coronary circulation.

UNIT – III**15 Hours****EXCRETION AND OSMOIONOREGULATION**

Introduction – kinds of excretory products – Kidney - structure and Mechanism of urine formation in mammals, hormonal regulation of excretion. Kidney failure and Transplantation. Osmoionoregulation in fishes and mammals.

UNIT – IV**15 Hours****NEUROMUSCULAR CO-ORDINATION**

Nervous tissue – Neuron – Structure, types of neurons. Nerve impulse – Synapse – Synaptic transmission of impulses – Neurotransmitters. Muscles – Types of muscles – Muscle Proteins – Mechanism of contraction – Cori cycle – Theories of muscle contraction.

UNIT – V**15 Hours****RECEPTORS AND ENDOCRINE SYSTEM**

Receptors – Photoreceptor – mammalian eye –structure of retina – visual pigments – physiology of vision – phonoreceptors – mammalian ear- Organ of Corti – working mechanism – phonoreception in bat. Endocrine glands – structure, secretions and functions of endocrine glands of vertebrates – Pituitary, Hypothalamus, Thyroid, Parathyroid, Adrenal, Thymus, Islets of langherhans, Testis and Ovary.

Text Books:

1. Verma, P.S, Tyagi B.S. and Agarwal V.K. 2000. Animal Physiology. S. Chand Publication.
2. Sambasivaiah, Kamalakara rao and Augustine chellappa 1990. A Text book of Animal physiology and ecology, S. Chand & co., Ltd., New Delhi – 110 055.

Reference Books:

1. Parameswaran, Anantakrishnan and Ananta Subramanyam, 1975. Outlines of Animal Physiology, S. Viswanathan [printers & Publishers] Pvt. Ltd.
2. William S. Hoar, 1976. General and comparative physiology, prentice Hall of India Pvt. Ltd., New Delhi. 110 001.
3. Wood.D.W, 1983, Principles of Animal Physiology 3rd Ed.,
4. Prosser,C.L. and Brown, 1985, Comparative Animal Physiology, Satish Book Enterprise, Agra – 282 003.

III B.Sc Zoology	ELECTIVE-I APPLIED ENTOMOLOGY	20EZ512A
SEMESTER – V		HRS/WK – 5
ELECTIVE-I (Compulsory)		CREDIT – 3

Objective:

1. To provide extensive knowledge in the field of Entomology.
2. The familiarity between insect and environment was highlighted to the entomological research in many directions which have immense value in the control measures various disease causing insects.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To describe the economic classification of insects

CO2: To understand the types of insect development

CO3: To know pests of stored products and their control

CO4: To describe pest control methods and application

CO5: To understand the production and marketing of pesticides

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER V	COURSE CODE: 20EZ512A					COURSE TITLE: ELECTIVE-I APPLIED ENTOMOLOGY										HOURS:5	CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	4	5	4	4	4	5	2	2	3	2	5	4	5	4.0	
CO2	5	5	4	5	3	4	4	4	3	2	3	2	5	3	5	3.8	
CO3	5	5	4	5	4	4	4	3	2	2	3	2	5	5	5	3.9	
CO4	5	5	4	5	5	4	4	3	1	3	3	2	5	5	5	4.0	
CO5	5	5	5	5	5	4	4	2	1	3	3	2	5	5	5	4.0	
Mean Overall Score															3.9		

Result: The Score of this Course is 3.9 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I**15 Hours**

INTRODUCTION – economic classification of insects - Types of pests – types of damage caused by pests in crops – causes for insects assuming pest status – outbreak of pests.

UNIT – II**15 Hours**

TYPES OF INSECT DEVELOPMENT – ametabola and metabola (hemi metabola, holometabola, paurometabola and hypermetabola) - Pests of agricultural importance, their bionomics, life cycle and control measures of paddy, ground nut, cotton, tomato, coffee & Banana.

UNIT – III**15 Hours**

PESTS OF STORED PRODUCTS AND THEIR CONTROL – Household pests – cockroach and termites – and their control – pest in relation to public health – rodents and their control. Mosquitoe borne diseases and their control measures.

UNIT- IV**15 Hours**

PEST CONTROL METHODS AND APPLICATION: cultural, mechanical, biological and chemical methods – classification of pesticides – LC 50 and LD 50 values – First Aid & precautions in handling pesticides – pesticide spraying appliances. Residual effects of pesticides on non target organisms.

UNIT – V**15 Hours**

PESTICIDE INDUSTRY - production and marketing – recent trends in pest control – pheromones, attractants, repellants and chemosterilants Integrated pest management, its importance & applications.

Text Books:

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

Reference Books:

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

III B.Sc Zoology	ELECTIVE – II PUBLIC HEALTH AND HYGIENE	20EZ513B
SEMESTER – VI		HRS/WK – 4
ELECTIVE –II (Optional)		CREDIT – 3

Objective:

1. To impart awareness on Public Health and Hygiene
2. To create knowledge on Health Education.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To understand public health and hygiene

CO2: To realize environment and health hazards

CO3: To understand the communicable diseases and their control measures.

CO4: To understand the non-communicable diseases and their control measures

CO5: To know the health education in India

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER V	COURSE CODE: 20EZ513B					COURSE TITLE: ELECTIVE - II PUBLIC HEALTH AND HYGIENE										HOUR S:4	CRED ITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	2	3	3	5	5	3	2	4	2	3	5	3	5	3.7	
CO2	5	5	2	3	3	5	5	3	2	4	2	3	5	3	5	3.7	
CO3	5	5	4	3	3	5	5	3	2	4	2	3	5	3	5	3.8	
CO4	5	5	4	3	3	5	5	3	2	4	2	3	5	3	5	3.8	
CO5	5	5	4	3	3	5	5	3	2	4	2	3	5	3	5	3.8	
Mean Overall Score															3.8		

Result: The Score of this Course is 3.8 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT-I**12Hours**

Scope of Public health and Hygiene – nutrition and health – classification of foods –Nutritional deficiencies - Vitamin deficiencies.

UNIT-II**12Hours**

Environment and Health hazards – Environmental degradation – Pollution and associated health hazards.

UNIT-III**12Hours**

Communicable diseases and their control measures such as Measles, Polio, Chikungunya, Rabies, Plague, Leprosy and AIDS.

UNIT-IV**12Hours**

Non-Communicable diseases and their preventive measures such as Hypertension, Coronary Heart diseases, Stroke, Diabetes, Obesity and Mental ill-health.

UNIT-V**12Hours**

Health Education in India – WHO Programmes – Government and Voluntary Organizations and their health services – Precautions, First Aid and awareness on sporadic diseases.

Text Books:

1. Park and Park, 1995: Text Book of Preventive and Social Medicine – Banarsidas Bhanot Publ. Jodhpur – India.
2. Dubey, R.C and Maheswari, D.K. 2007 : Text Book of Microbiology – S. Chand & Co. Publ. New Delhi – India.

Reference Books:

1. Verma, S. 1998 : Medical Zoology, Rastogi publ. – Meerut – India
2. Singh, H.S. and Rastogi, P. 2009 : Parasitology, Rastogi Publ. India

III B.Sc Zoology	ENVIRONMENTAL BIOLOGY	20ZO614
SEMESTER – VI		HRS/WK – 5
CORE – XI		CREDIT – 4

Objective:

1. To learn the scope of environmental biology, importance of protection and conservation of wild life to maintain the ecosystem balance.
2. To create awareness about the environmental problems and motivate the students to participate in environment protection and sustainable utilization of natural resources.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To realize the scope and concept of environmental biology

CO2: To describe structure and functions of ecosystem.

CO3: To understand biogeochemical cycles and animal association

CO4: To describe population and community of an ecosystem and management of natural resources

CO5: To get knowledge on environmental degradation and their effects and remedy measures

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE: 20ZO614					COURSE TITLE: ENVIRONMENTAL BIOLOGY										HOUR S: 5	CRED ITS:4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	4	5	5	3	1	4	3	1	5	5	5	4.1	
CO2	5	5	5	5	4	5	5	3	1	4	3	1	5	5	5	4.1	
CO3	5	5	4	5	4	5	5	5	1	4	3	1	5	5	5	4.1	
CO4	5	5	4	5	4	5	5	4	1	4	3	1	5	5	5	4.1	
CO5	5	5	4	5	4	5	5	3	1	4	3	1	5	5	5	4	
Mean Overall Score																4.1	

Result: The Score of this Course is 4.1 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I**15 Hours**

Scope – concept – Branches in ecology – Autecology, synecology - types of media and substratum and their influences on animals – **Water:** Properties, Forms of water, Soft and hard water. **Air** composition – properties. **Substratum:** Soil -Types, soil formation, soil group of India, soil profile.

UNIT – II**15 Hours**

Biosphere – Hydrosphere – Lithosphere – Atmosphere – temperature: Distribution of temperature, thermal stratification – Temperature as a limiting factor, thermal adaptations. Light as a limiting factor. Ecosystem-concept, components, types, structure and functions.

UNIT – III**15 Hours**

Biogeochemical cycles – gaseous cycle [C,N₂& S] sedimentary cycle, [phosphates]. **Animal association** - Intra specific and inter specific - colony formation, social organization, predation, parasitism, commensalisms, mutualism, inter specific competition – competitive principle or Gause's principle.

UNIT – IV**15 Hours**

Population: Definition – characteristics – Natality, Mortality, age distribution of Population growth forms, population fluctuation. Community Ecotone and edge effects – ecological succession. Conservation - **Wild life management**, Preservation – laws enforced – sanctuaries, National parks. **Natural resources management:** renewable and non-renewable.

UNIT – V**15 Hours**

Environmental degradation – deforestation, urbanization, population explosion and other environmental hazards – Environmental ethics and laws – Earth summits – role of governmental agencies for environmental monitoring.

Text Books:

1. Kotpal. R.L, and N.P. Bali, 1986. Concepts of Ecology, Vishal Publications, New Delhi-7
2. Rastogi V.B, and M.S. Jayaraji, 1988 – 1989 Animal Ecology and Distribution of animals, Kedarnath, Ram Nath Meerut – 250 001.

Reference Books:

1. Clark, G.L. 1954, Elements of Ecology, John Wiley & Sons Inc., New York, London.
2. Ananthakrishnan, T.N, and S. Viswanathan, Principles of Animal Ecology.
3. Eugene P. Odum, 1971. Fundamentals of ecology, Saunders International Student Edition, W.B. Saunders Company, Philadelphia London, Toronto.
4. Verma, P.S and Agarwal 1986, Environmental Biology, S. Chand & Co Ltd. New Delhi.

III B.Sc Zoology	ECONOMIC ZOOLOGY	20ZO615
SEMESTER – VI		HRS/WK – 5
CORE – XII		CREDIT – 4

Objective:

1. To impart the importance of valuable animals like earth worms, silk worms, honey bees, fishes, prawns, oysters and cattle.
2. To study the rearing methods of these organisms with an economic point of view.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To acquire knowledge on vermiculture, apiculture and sericulture

CO2: To describe prawn culture, pearl culture and pisciculture

CO3: To acquire knowledge on poultry

CO4: To describe dairy farm and sheep farm

CO5: To understand future strategies for livestock development

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE: 20ZO615					COURSE TITLE: ECONOMICZOOLOGY										HOUR S: 5	CRED ITS:4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5	
CO2	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5	
CO3	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5	
CO4	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5	
CO5	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5	
Mean Overall Score																4.5	

Result: The Score of this Course is 4.5 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I**15 Hours****Vermiculture: Composting of Earthworms**-Methods of composting.**Apiculture** - Species of Honeybees –Construction of Apiary-Honey extraction – Economics of Apiculture and management.**Sericulture** – Nature and economic importance of sericulture in India.**UNIT –II****15 Hours****Prawn culture** – Culture techniques of fresh water [*Macrobrachium rosenbergii*] & Marine water (*Penaeus monodon*)**Pearl culture:** Formation and nature of Pearls – Commercial importance of Pearl Culture in India.**Pisciculture**– Techniques of induced breeding, commercial culture of catla & catfish, By-products of fishing and its commercial values.**UNIT – III****15 Hours****Poultry**- Morphology of different breeds of Chicken – Brooding and Rearing of Chicks – Processing of Egg, Meat and By-Products of Poultry.**UNIT – IV****15 Hours****Dairy farm** - management, Milch breeds. Draught Breeds, Dual Purpose breeds and New cross Breeds of Cows and Buffaloes in India.**Sheep farm:** Indigenous and Exotic breeds of sheep, management**UNIT – V****15 Hours****Future strategies for Livestock Development** – Transgenic animal Technology – Genetic Improvement for best Breeds – Economic importance of Dairy, Leather, Wool, Fur and Pharmaceutical Industries in India.**Text Books:**

1. Sukla, G.S. and Upadhyay, V.B., 2000 Economic Zoology – ISBN – 81- 7133 -137 -8 Rastogi Publication, Meerut, India
2. JawaidAhsan and Subhas Prasad sinha – 2000 A Handbook on Economic Zoolgy - Chand & co., Ltd., New Delhi.

Reference Books:

1. Ashok Kumar and Prem Mohan Nigam, 1991 Economic and Applied Entomology Emkay Publication, New Delhi.
2. Shammi,Q.J. and Bhatnagar, S., 2002 Applied Fisheries Agrobios [India],Jodhpur - India
3. Major Hall, C.B. 2005 Ponds and Fish culture. Agrobios [India], Jodhpur - India
4. Keith Wilson, N.D.P., 2005 A Handbook of Poultry Practice Agrobios [India], Jodhpur - India
5. Banerjee, G. C. 1992 Poultry – III – Edition Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Banerjee, 1988 A Text book of Animal Husbandry – VIII- Edition xford& IBH Publishing co. Pvt. Ltd., New Delhi.
7. Kaushish, S.K., 2001 Trends in livestock Research Agrobios [India], Jodhpur - India
8. Ismail, S.A1997. Vermicology the Biology of Earth worm orient Longman, India.
9. Mary Violet chrishty .A 2008 Vermi technology MJP Publ. Chennai.

III B.Sc Zoology	EVOLUTION	20ZO616
SEMESTER – VI		HRS/WK – 5
CORE – XIII		CREDIT – 4

Objective:

1. To learn the outline of major transitions in evolution from origin of life, process of evolution and biological diversity.
2. To gain knowledge on natural selection, behavior and distribution of animals

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To describe the evidences of evolution

CO2: To realize the theories of evolution like Lamarckism and Darwinism,

CO3: To recognize natural selection and types of variation.

CO4: To describe mimicry behavior and distribution of animals

CO5: To understand isolation and evolution of man

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE: 20ZO616					COURSE TITLE: EVOLUTION										HOUR S:5	CRED ITS:4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	2	3	3	5	5	3	2	4	2	3	5	3	5	3.7	
CO2	5	5	2	3	3	5	5	3	2	4	2	3	5	3	5	3.7	
CO3	5	5	4	3	3	5	5	3	2	4	2	3	5	3	5	3.8	
CO4	5	5	4	3	3	5	5	3	2	4	2	3	5	3	5	3.8	
CO5	5	5	4	3	3	5	5	3	2	4	2	3	5	3	5	3.8	
Mean Overall Score															3.8		

Result: The Score of this Course is 3.8 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I**15 Hours**

Evidences for Evolution: The need of evidences for the fact of evolution –Morphological evidences, anatomical evidences, Embryological evidences, Physiological evidences and Biochemical evidences.

UNIT – II**15 Hours**

Theories of Evolution: Lamarckism- principles and criticism, Neolamarckism, Darwinism- principles and criticism, NeoDarwinism, De vries concept of Mutation. Modern version of Mutation theory.

UNIT – III**15 Hours**

Natural selection: Types, stabilizing selection, diversifying selection and directional selection.
Variation: Types of variation, factors causing variation.

UNIT-IV**15 Hours**

Mimicry – types of mimicry - mimicry and evolution: Batesian mimicry and mullerian mimicry and evolution, Fossils – Fossilization - living fossils. Distribution of animals: methods, classification and patterns of distribution.

UNIT – V**15 Hours**

Isolation – Premating and post mating isolating mechanism, speciation – role of isolation in speciation. **Evolution of man** –Biological evolution of man, fossils of human evolution -cultural evolution of man.

Text Books:

1. Agarwal, V.K and Usha Gupta –1990. Evolution and animal distribution, Chand and Co.,
2. Veer BalaRastogi. Organic Evolution, Meerut Publications.

Reference Books:

1. Dodson,E.O.. Evolution, Reinhold, Newyork.
2. Francisco.J.Ayla – Evolution, Surject publication.
3. Gopalakrishnan.T.S. IttaSambasivaiah and A.P.KamalakaraRao. Principles of organic Evolution, Himalaya publishing house.
4. Ranganathan T.K., Evolution. 1994 Rainbow Printers, Palayankottai.
5. Arumugam.N. Organic Evolution, 2009 Saras. Publ. Nagarcoil.

III B.Sc Zoology	ELECTIVE-III AQUACULTURE	20EZ617A
SEMESTER – VI		HRS/WK – 4
ELECTIVE-III (Compulsory)		CREDIT –4

Objective:

1. To provide basic information on production of low cost, protein rich, nutritive, edible and easily digestible human food by aquaculture.
2. To introduce new species and technique to strengthen the stocks of existing fish from natural resources by artificial recruitment.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To understand the principles of site selection for aquaculture.

CO2: To describe different types of aquaculture practices.

CO3: To know the criteria for aquaculture species selection and water quality management.

CO4: To describe nutritional requirements and feed formulation for aquaculture organisms

CO5: To acquire knowledge in Mari culture

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE: 20EZ617A					COURSE TITLE: ELECTIVE-III AQUACULTURE										HOUR S: 4	CRED ITS:4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	4	4	5	1	1	2	4	1	5	4	5	3.7	
CO2	5	5	5	5	4	4	5	1	1	2	4	1	5	4	5	3.7	
CO3	5	5	5	5	4	4	5	4	1	2	4	2	5	4	5	4.0	
CO4	5	5	5	5	4	4	5	3	1	2	4	2	5	4	5	4.0	
CO5	5	5	5	5	4	4	5	1	1	2	4	1	5	4	5	3.7	
Mean Overall Score															3.8		

Result: The Score of this Course is 3.8 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT I**12 Hours**

Definition, objectives and scope of aquaculture – Principles of site selection for fish farms, Factors for site selection: Ecological - water, soil types and other parameters, Biological factors, Socioeconomic factor, Political and legal factors.

UNIT II**12 Hours**

Types of aquaculture - Monoculture, Poly culture, Integrated farming- Fish cum Duck, Fish cum Poultry, Fish cum Dairy and Paddy cum Fish, Pond culture, Pen culture, Cage culture, Raft culture, Race way culture, Warm and cold water fish culture .

UNIT III**12 Hours**

Criteria for selection of variety – Seed procurement: Inn natural habitat, Bundh breeding and induced breeding- stocking management: Pre stocking and stocking. Water quality management.

UNIT IV**12 Hours**

Nutritional requirements and formulation of artificial diets. Breeding and culture of fresh water fishes – Catla, *Mrigala* and Rohu. Tilapia culture – monosex culture, procurement of male seed for monosex culture.

UNIT V**12 Hours**

Mari culture – Culture of edible oyster: spat collection methods, culture methods - pearl oyster culture, mussel culture, clam culture, sea urchin culture, sea cucumber culture – artificial breeding technique of sea cucumber.

Text Books:

1. Arumugam N. 2008. Aquaculture, Saras Publication

Reference Books

1. Fish and Fisheries in India, Jhingran, V.G., 1982, Hindustan Publishing Corporation, New Delhi
2. Principles and practices of Pond Aquaculture, Annan, J.F, R.O. Smiteman and G. Tehebenoglous (Eds), 1983, Oregon State University, U.S.A.
3. Home Aquarium: aquatic gema and tropical fish, 1970, Makinos Japan Publications.
4. Aquaculture principles and practices, 2005 TVR Pillai, John Wiley Publisher.

III B.Sc Zoology	Skill Based Subject SERICULTURE	20EZ618B
SEMESTER – VI		HRS/WK – 3
Skill Based Subject (Optional)		CREDIT – 3

Objective:

1. To acquire knowledge on economic importance of sericulture.
2. To understand the species of silk moth and techniques in sericulture.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To gain knowledge on introduction and importance of sericulture

CO2: To understand classification and biology of silk moth

CO3: To describe the tools of sericulture

CO4: To get knowledge on harvesting methods in sericulture

CO5: To realize the economic status of sericulture

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE: 20EZ618B					COURSE TITLE: Skill Based Subject SERICULTURE										HOURS: 3	CREDITS :3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	4	5	4	4	4	3	1	2	3	1	5	2	5	3.5	
CO2	5	5	4	5	4	4	4	5	3	2	3	1	5	2	5	3.8	
CO3	5	5	5	5	4	4	4	4	2	2	3	1	5	2	5	3.7	
CO4	5	5	5	5	4	4	4	3	2	2	3	1	5	2	5	3.7	
CO5	5	5	5	5	4	4	4	3	1	2	3	1	5	2	5	3.6	
Mean Overall Score															3.7		

Result: The Score of this Course is 3.7 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I**9 Hours**

Introduction – Importance of sericulture– Mulberry plant - Classification of commercial varieties of mulberry. Mulberry plant cultivation practices.

UNIT – II**9 Hours**

Classification and Biology of silk moth – familiar and economically important types of silkworms – life cycle study of *Bombyx mori*. Diseases of silk worms – fungal, bacterial, viral and nematode diseases, deficiency diseases and their remedial measures.

UNIT – III**9 Hours**

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

UNIT – IV**9 Hours**

Harvesting methods- Physical and commercial characters of cocoons. Reeling operations, importance of by – products of Sericulture.

UNIT – V**9 Hours**

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

Text Books:

1. Johnson M. and Kesary M., Sericulture. Saras Publication.
2. Ganga, G. and Sculochana Chetty, J. 1997: An Introduction to sericulture Oxford – IBH Publ. Co. India.

Reference Books:

1. Ganga, G. 2003: comprehensive sericulture Vol-I, Moriculture – Oxford –IBH Puubl. Co. India.
2. Ganga, G. 2003: comprehensive sericulture Vol –II Silkworm rearing – Oxford – IBH Publ. Co. India.

III B.Sc Zoology	CORE PRACTICAL – III BIostatistics, ANIMAL PHYSIOLOGY, DEVELOPMENTAL BIOLOGY AND IMMUNOLOGY	20ZOP63
SEMESTER – V & VI		HRS/WK – 3
CORE PRACTICAL –III		CREDIT – 4

BIOSTATISTICS:

Biological data – calculation of mean, median, mode, Mean and standard deviation.
Graphical representation – Bar, Pie, frequency distribution.
Demonstration of MS- word, MS-Excel and MS-PPT.

ANIMAL PHYSIOLOGY:

Activity of human salivary amylase in relation to PH, Enzyme concentration and Temperature.
Estimation of Oxygen consumption in a fish with reference to body weight.
Detection of nitrogenous waste products in fish tank water, frog tank water, bird excreta and mammalian urine.
Use of Kymograph Unit, B.P. apparatus, stethoscope.

DEVELOPMENT BIOLOGY:

Study of the following prepared slides / museum specimens.
Section of testis and Ovary [Mammalian].
Slides of Mammalian sperm and ovum.
Study of Egg types – Frog’s Egg, Hen’s Egg.
Study of cleavage stages 2 Cell, 4Cell, 8Cell – Blastula and gastrula of Frog.
Slides of different stages of chick embryo –24 hours, 33 hours,48 hours 72 hours and 96 hours.
Placenta of Sheep, Pig and Man.

IMMUNOLOGY:

Study of Antigen – Antibody reaction – Human Blood grouping [ABO and Rh].
Study of prepared slides of histology: Thymus, Spleen, Bone marrow, Lymph node.

III B.Sc Zoology	CORE PRACTICAL - IV ENVIRONMENTAL BIOLOGY, ECONOMIC ZOOLOGY AND EVOLUTION	20ZOP64
SEMESTER – V & VI		HRS/WK – 3
CORE PRACTICAL –IV		CREDIT – 4

Estimation of Dissolved oxygen, salinity, pH, Free CO₂, Carbonate and Bicarbonates in water samples.

Use of rain gauge, Maximum and Minimum thermometer, Hygrometer and Anemometer.

Plankton study – fresh water and Marine plankton.

Study of natural ecosystem and field report.

ECONOMIC ZOOLOGY:

Study of the following prepared slides / specimens.

Earthworm types [any two] – [vermiculture].

Megacolex mauritii – south Indian species – surface crawlers.

Drawida modesta – Red soil with calciferous gland.

Pheretima posthuma – North Indian – Large specimen.

Eudrilus eugenia – Red worm, Exotic.

Fish parasites [*Lernea*, *Argulus*].

Larvivorous fishes :

Poecilia reticulate – Guppy.

Gambusia affinis – Gambusi.

Colisa labia – Dwarf gowrami.

Different stage of **Silk worm**.

Types of Honey **Bees**.

Common **Pests**.

EVOLUTION

Fossils – Ammonite.

Living fossils – Limulus, sphenodon.

Conneting link – *Peripatus*, *Archaeopteryx*.

Evolutionary significance – *Exocoetus*, Draco, Hippocampus.

Mimicry – Monarch butterfly.

Camouflage – Chameleon.

III B.Sc Zoology	MEDICAL CODING	CODE:
SEMESTER – VI		HRS/WK – 2
SDC		CREDIT – 2

Objective:

To impart an overview of basic concepts of medical coding

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To describe the medical terminology and coding

CO2: To know the guidelines and rules of ICD-10-CM Coding.

CO3: To understand CPT coding evaluation.

CO4: To describe surgery, digestive system, urinogenital coding.

CO5: To understand pulmonology, cardiovascular, radiology coding.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE:					COURSE TITLE: MEDICAL CODING										HOURS: 2	CREDITS: 2
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	4	4	4	5	5	4	4	5	4	1	5	1	5	4.1	
CO2	5	5	4	4	4	5	5	4	4	5	4	3	5	1	5	4.2	
CO3	5	5	4	4	4	5	5	4	4	5	4	1	5	1	5	4.1	
CO4	5	5	4	4	4	5	5	4	4	5	4	1	5	1	5	4.1	
CO5	5	5	4	4	4	5	5	4	4	5	4	2	5	1	5	4.1	
Mean Overall Score																4.1	

Result: The Score of this Course is 4.1 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT –I: 6 Hours

The World of Health Care: Medical Terminology: Medical Ethics: Diagnostic Coding.

UNIT –II: 6 Hours

ICD-10-CM Diagnosis Coding: Guidelines and Rules: ICD-10-CM Coding from Infections to Blood Diseases: ICD-10-CM Coding from the Digestive System to Pregnancy: ICD-10-CM Coding from Symptoms to Complications.

UNIT –III: 6Hours

Z Codes, S Codes and ICD-10-CM Coding Practicum: CPT Coding: CPT Coding from the Integumentary System: CPT Coding Evaluation and Management Services.

UNIT – IV: 6 Hours

Comprehensive Surgery Coding: Musculoskeletal Coding: Digestive System Coding: Urology and Reproductive system coding: .

UNIT- V: 6 Hours

Pulmonology and Cardiovascular coding: CPT Coding for Radiology, Pathology: Anesthesia coding: HCPCS coding.

Text Books

1. Karen Smiley 2019 Medical Billing & Coding For Dummies, 3rd Edition (For Dummies (Career/Education))
2. Sandra L. Johnson and Robin Linker 2016. Understanding Medical Coding : A Comprehensive Guide: CENGAGE Learning Custom Publishing

Reference Books

1. Betsy J. Shiland Medical Terminology & Anatomy for Coding-4E Paperback – 7 October 2020.
2. Logan Taylor. Medical Billing & Coding for Beginners 2023: The Ultimate Guide to Start a Successful Career in Medical Billing & Coding to Secure a Bright Financial Future Kindle Edition

III B.Sc. Zoology	PROJECT	JZO601
SEMESTER -VI		
PROJECT		CREDIT-2

COURSE OBJECTIVES:

- To provide students with practical experience in biology and biodiversity of organisms.
- To encourage the students to learn the skills in observing and studying nature, biological techniques and scientific investigation.
- To learn the unity and diversity of organisms.
- To learn about applied branches of zoology and prepare for self-employment.

COURSE OUTCOMES:

Upon successful completion of this course, students will be able to:

- Learn the fundamentals of animal sciences and complex interaction between living organisms.
- Understand the basic theories and principles of ecology.
- Learn about gene, genome, cell, tissue, organ and organ system.
- Learn about evolutionary history and relationship between different groups of animals
- Obtain practical knowledge on Vermiculture, Mushroom culture, Aquaculture, Sericulture etc.

COURSE CONTENT:

1. Introduction about the Projects

- Overview of project work
- Selection of project topics based on recent trends in Zoology

2. Project Design and Development

- Culturing techniques of animals
 - Selection and procurement of cultivable species
 - Toxicological studies, pollution studies, growth parameters and biology of animals.

3. Documentation and Report Writing

Arrangement of contents

1. Title Page
2. Bonafide Certificate
3. Acknowledgement
4. Table of contents
5. Abstract
6. Chapters of the Report
7. References
8. Appendices, if any

Appendices should be named as APPENDIX –A

Binding Specification

- Project report should be submitted with hard bound.
- The Cover should be colour printed.

Margin Specification

Top	: 4 cms
Bottom	: 3 cms
Left	: 4.5 cms
Top	: 2.5 cms

Page Numbering

All Page numbers should be typed without punctuation on the bottom center portion of the page. The Preliminary pages (table of contents and abstract) should be numbered in lowercase roman literals.

4. Presentation and Defense

- Preparing for the project presentation
- Effective communication of project work

THEMES

Students can choose a project theme from the following areas:

1. Studies on the biology of animals

Study of anatomy, behavioural ecology etc.

2. Taxonomical status of animals

Systematic classification, phylogeny of animals etc.

3. Biodiversity study

Species, genetic and ecological diversity

4. Biochemical studies

Biochemical composition, Nutritional value etc.

5. Pollution

Causes, concentration, effects of pollution etc.

6. Environmental issues

Biodiversity laws, waste management, climate change etc.

7. Culturing technology of organisms

Culturing techniques of various organisms

8. Molecular techniques

DNA study, genetical studies, molecular study etc.

9. Entomological studies

Economic classification of insects, pest control measures etc.

10. Physiology of animals

Physiological function of various system

III B.Sc Zoology	VERMITECHNOLOGY	19ZOSS52
SEMESTER – VI		
SSC-Self Study Course		CREDIT – 2

Unit I: INTRODUCTION

Earthworm- structures, Geographical distribution, Classification based on habitat, (i) epigeics, (ii) anecics and (iii) endogeics.

Unit II:IDENTIFICATION

i) Cocoon ii) Juvenile iii) Adult iv) Speciesv) Burrowingvi) Feeding vii) Casting.

Unit III: SPECIES SUITABLE FOR VERMICOMPOSTING

Species Advocated for Vermicomposting, Species used in India

Unit IV:CONVENTIONAL STEPS INVOLVED IN VERMICOMPOSTING

Steps of vermicomposting set up, Vermibed preparation, Management,

Unit V: VERMICAST

Practical –and harvesting techniques of vermicast, Marketing of vermicompost.

REFERENCES:

1. S. Gajalakshmi, Indian Journal of Biotechnology Vol 3, October 2004, pp 486-494.
2. T. Ganeshkumar, Lambert Academic Publishing, 2013.
3. T. Ganeshkumar, Bioresources and Bioprocessing, 2014, 1:26.

QUESTION PAPER PATTERN

Continuous Internal Assessment (CIA) 25marks

1. Two Internal Examinations	15 marks
2. Assignment/ Seminar	5 marks
3. Attendance	5 marks

Total **25 marks**

Semester Examination (75 marks)

Time: 3Hrs

Max. Marks: 75

A Question paper consists of three parts

Part-A

10 very short answer questions without choice. Each question is to be answered in about 50 words. Two questions from each unit. Each answer is to be valued out of 2 marks.

Part-B

5 questions are to be answered in either or type. Each question is to be answered in about 300 words. Two questions from each unit. Each answer is to be valued out of 5 marks.

Part-C

3 questions are to be answered out of 5 questions given, one question from each unit to be answered in about 1000 words. Each answer is to be valued out of 10 marks.

Part-A

Very Short Answers (50 words) 10 questions each 2 marks. (10x2=20 Marks)

Part-B

Short Answers (300 words) 5 question each 5 marks. (5x5=25 Marks)

Part-C

Essay questions (1000 words) 3 questions each 10 marks. (3x10=30 Marks)

TOTAL

75 Marks

PRACTICAL EXAMINATION

Continuous Internal Assessment (CIA) (40 marks)

Based on the periodical evaluation of Record, Observation record and Experiments assessed by the staff incharge.

External Examination (60 marks)

Time: 3 Hrs

Practical	- 50 marks
Record	- 10 marks
Total	- 60 marks

II B.Sc (Microbiology)	CLASSICAL GENETICS & BIO-STATISTICS	19AZMB31
SEMESTER - III		HRS/WK – 5
ALLIED		CREDIT – 4

Objective:

To provide basic knowledge in the field of genetics and applications of biostatistics for data analysis.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To understand the history of genetics and Mendel's laws

CO2: To understand recombination in Eukaryotes

CO3: To describe molecular, human and and cytogenetics

CO4: To obtain knowledge on introduction, scope, importance and functions of biostatistics

CO5: To analyze correlation, regression and test of significance

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER III	COURSE CODE: 19AZMB31					COURSE TITLE: CLASSICAL GENETICS & BIO-STATISTICS										HOURS: 5	CREDITS :4
	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)											
COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	3	5	4	5	4	2	2	4	4	3	5	2	5	3.9	
CO2	5	5	4	5	4	4	4	2	3	4	4	3	5	2	5	4.0	
CO3	5	5	4	5	4	4	4	2	4	4	4	3	5	2	5	4.0	
CO4	5	5	4	5	4	4	4	2	2	4	4	4	5	2	5	4.0	
CO5	5	5	4	5	4	4	4	2	1	4	4	4	5	2	5	3.9	
Mean Overall Score																4.0	

Result: The Score of this Course is 4.0 (High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I: 15 Hours

GENETICS AND MENDEL’S LAWS:

History of genetics – Mendel’s experiments: monohybrid, dihybrid Cross - hybrid vigour – pleiotropism - epistasis - lethal genes – atavism –polygenic inheritance Multiple Alleles and linkage - ABO Blood Group inheritance - Rh factor – linkage and linkage group.

UNIT – II: 15 Hours

RECOMBINATION IN EUKARYOTES:

Crossing over –Mechanism- factors controlling crossing over – mitotic and meiotic crossing over – somatic and germinal crossing over – significance of crossing over - construction of chromosome maps –chromosomes – size, shape, structure, types and physiology of chromosomes.

UNIT – III: 15 Hours

MOLECULAR, HUMAN AND CYTOGENETICS:

DNA as the genetic material – structure of DNA, euploidy - aneuploidy – chromosomal aberrations - Pedigree analysis – eugenics and euphenics – inbreeding, outbreeding and hybrid vigour - population genetics.

BIO-STATISTICS

UNIT – IV: 15 Hours

Introduction – Scope – Definition –Data collection – Methods of data collection – Classification of Data – Tabulation of Data – Diagrammatic, Graphical presentation of Data – Histogram – Frequency polygon – Oogive curves. Measures of central tendency - Arithmetic mean – Median – Mode – standard deviation– mean deviation – skewness – kurtosis.

UNIT –V: 15 Hours

Correlation – simple correlation – Rank correlation – Regression – Probability – Addition theorem – Multiplication theorem – Test of significance – Hypothesis testing – Null hypothesis – Large sample test – small sample test (Students ‘t’ test) – chi-square test – standard error – ANOVA (Analysis of variance) – one way ANOVA.

Text Books:

1. Verma, P.S and Agarwal, V.K 2005. Cell Biology, Genetics, Molecular Biology, Evolution & Ecology’, S. Chand and Co., New Delhi.
2. P. Ramakrishnan, Biostatistics. Saras Publications 1996 A.R.P. Camp Road, Kottar, Nagarkoil, Kanyakumari District.
3. Gurumani, Elements of Biostatistics, Nithi Publishers.

Reference books:

1. Veer Bala Rastogi. 1992 .A textbook of Genetics, 9th edition, Keda Nath Ram Nath, New Delhi.
2. Karvita B. Aluwalia , 1991. ‘Genetics’ Wiley Eastern Ltd, New Delhi .
3. Sarin, C.1990. ‘ Genetics’ Tata Mcgraw – Hill Publishing Co ., Ltd., New Delhi.
4. Burns. G.W .and Boltsmo, P.J. 1989. The Science of Genetics’ Macmillan publishing Co ., New York.

II B.Sc (Microbiology)	CLASSICAL GENETICS & BIO-STATISTICS- PRACTICALS	19AZMP31
SEMESTER – III		HRS/WK – 3
ALLIED PRACTICALS		CREDIT - 2

Genetics

1. Squash preparation of Salivary glands of chironomous larva (Giant chromosome).
2. Male & Female identification of Drosophila.
3. Observation of common Mutants of Drosophila.
4. Human Blood Grouping
5. Human pedigree construction for a family data

Biostatistics

- Mean, Median, Mode and Standard deviation.
- Correlation and Regression Analysis.

II B.Sc (Microbiology)	APPLIED ENTOMOLOGY	19AZMB42
SEMESTER – IV		HRS/WK – 5
ALLIED		CREDIT – 4

Objective:

1. To provide extensive knowledge in the field of applied entomology.
2. The familiarity between insect and environment was highlighted to various field like agricultural entomology, medical entomology and industrial entomology

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To obtain knowledge on basic introduction of entomology

CO2: To recognize beneficial and harmful insects in the agricultural entomology

CO3: To describe vector borne diseases, control measures and awareness in medical entomology

CO4: To identify productive insects in industrial entomology

CO5: To understand pest control methods and application

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER IV	COURSE CODE: 19AZMB42					COURSE TITLE: APPLIED ENTOMOLOGY										HOUR S: 5	CRED ITS:4
	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)											
COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	5	5	5	3	2	4	4	2	5	1	5	4.1	
CO2	5	5	5	5	5	4	5	5	2	4	4	2	5	2	5	4.2	
CO3	5	5	5	5	5	4	5	5	2	4	4	2	5	3	5	4.3	
CO4	5	5	5	5	5	4	5	5	3	4	4	2	5	3	5	4.3	
CO5	5	5	5	5	5	4	5	4	2	4	4	2	5	3	5	4.2	
Mean Overall Score																4.2	

Result: The Score of this Course is 4.2 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT – I **15 Hours**
INTRODUCTION TO ENTOMOLOGY

Definition – classification upto orders - scope- Agricultural entomology, Forest entomology, Veterinary entomology, Medical entomology, Forensic entomology, Industrial entomology.

UNIT – II **15 Hours**
AGRICULTURAL ENTOMOLOGY

Pest identification marks, nature, symptoms of damage. Any three pests - rice, Maize, pulses, sugar cane, cotton, coconut, ground nut, brinjal, cardamom, tea, coffee.

Pollinators, Destroyers of insect pests, Serve as food, Destroyers of weeds, Improve soil fertility.

UNIT – III **15 Hours**
MEDICAL ENTOMOLOGY

Life cycles of arthropod vectors - ticks, mites and fleas. Vector borne diseases: malaria, filariasis, dengue. Vector control- Chemical, Biological, Genetic and Environmental. Insecticide resistance in vectors. Drug resistance in pathogens. Importance of education, awareness and Community participation.

UNIT – IV **15 Hours**
INDUSTRIAL ENTOMOLOGY

Productive Insects (a) Honey bee: Apiculture and its scope; life history, Bee products- Honey and Bee wax, and Uses, Bee diseases. (b) Silk moth: Different types of silkworms, life cycle; Sericulture, uses of silk, silk worm diseases. (c) Lac insect: Different strains of Lac insects, uses of lac.

UNIT – V **15 Hours**
PEST CONTROL METHODS AND APPLICATION:

Cultural, mechanical, biological and chemical methods – classification of pesticides. First Aid & precautions in handling pesticides – pesticide spraying appliances. Residual effects of pesticides on non target organisms. Pesticide industry- production and marketing – Integrated pest management, its importance & applications.

Text Books:

1. Vasantharaj David and T. Kumaraswami 1988. Elements of Economic Entomology Popular Book Depot, Chennai.
2. Nayar, K.K., Ananthakrishnan, T.N. and B.V. David 1992 General and Applied Entomology Tata McGraw, New Delhi.

Reference Books:

1. P.G. Fenemore and AlkaPrakash 1997 Allied Entomology, Wiley Eastern Ltd., New York.
2. Wigglesworth J.B., 1994. Insect Physiology, Chapman and Hall, London.
3. Temphare D.B., 1984 A. Text Book of Insects Morphology, Physiology and Endocrinology. S. Chand and Co., New Delhi.
4. A.Upadhyaya, K.Upathyaya and N.Nath, 2003 Biophysical chemistry, Principles and Techniques, 3rd Ed, Himamalaya publishing house.
5. H.B.Bull, F.H.Davis, 1971. An introduction to physical Biochemistry 2nd Ed, Philadelphia
6. Gurumani.N 2006. Research methodology for biological sciences MJP publ. Chennai.

II B.Sc (Microbiology)	APPLIED ENTOMOLOGY-PRACTICAL	19AZMP42
SEMESTER - IV		HRS/WK – 3
ALLIED		CREDIT -2

Major Practical

1. Methods of insect collection and preservation - Submission of insect box, Field visit.
2. Identification of at least 10 insects belonging to different orders.
3. Mounting of salivary gland of cockroach, mouth parts of cockroach, housefly, and mosquito.
4. Mounting of different types of antennae and legs of insects, wings and their venation.
5. Demonstration of digestive, reproductive (male and female) and nervous system of insects (Cockroach or Odontopus).

Spotters

1. Histological slides –T.S of testis, L.S. of ovary and types, T.S. of carpus cardiacum and T.S. of carpus allatum.
2. Life history of silkworm (egg, larva, cocoon and adult).
3. Identification of honey bee sting Identification of honey bees, drone, workers and queen.

II B.Sc (Biochemistry)	ADVANCED ZOOLOGY	AZBC401T
SEMESTER - IV		HRS/WK – 5
ALLIED		CREDIT – 4

Objective:

To understand the basic concepts of animal kingdom, Invertebrates, Chordates, cytological techniques, human genetics, developmental biology, ecology and evolution.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To describe structure and functions of some invertebrate species

CO2: To describe structure and functions of some chordate species

CO3: To analyze cytological techniques and human genetics

CO4: To understand developmental biology

CO5: To understand the basic concepts of ecology and evolution

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER IV	COURSE CODE: AZBC401T					COURSE TITLE: ADVANCED ZOOLOGY										HOUR S: 5	CRED ITS:4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	4	5	4	5	5	5	5	5	5	2	5	3	5	4.5	
CO2	5	5	4	5	4	5	5	5	5	5	5	2	5	3	5	4.5	
CO3	5	5	4	5	4	5	5	5	5	5	5	5	5	3	5	4.7	
CO4	5	5	4	5	4	5	5	5	5	5	5	3	5	3	5	4.6	
CO5	5	5	4	5	4	5	5	5	4	5	5	3	5	3	5	4.5	
Mean Overall Score																4.6	

Result: The Score of this Course is 4.6 (Very High)

Association Scale	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

Unit: 1 **15 Hours**
INVERTEBRATES - Structural and functional details of phylum-Protozoa-*Plasmodium vivax*, Helminthes-*Taeniasolium*, Annelida-Earthworm- Digestive system,

Unit: 2 **15 Hours**
CHORDATES- Prochordata – amphioxus- Morphological details of chordates- Pisces-shark, Amphibia -Frog, Reptiles- Calotes, Aves- pigeon, Mammalia- Rat.

Unit: 3 **15 Hours**
CYTOLOGICAL TECHNIQUES AND HUMAN GENETICS – Histological techniques – Fixation- selective fixatives- Embedding- Sectioning and Staining Principles. Mendel's experiments. Mutation, Linkage and Crossing over, Eugenics, Human chromosome, Chromosome number, Idiogram. Population genetics- Hardy Weinberg principle and its application in human population. Genetic engineering and its applications in human being. Pedigree chart and its uses.

Unit: 4 **15 Hours**
DEVELOPMENTAL BIOLOGY- Gametogenesis in mammals – Spermatogenesis, Oogenesis, Fertilization. Types of Eggs, Pattern of cleavage, Blastulation and Gastrulation in chick. Human Reproduction- Puberty, Menstrual cycle, Menopause, Pregnancy and related problems-Parturition and lactation- Human cloning- Ethics.

Unit: 5 **15 Hours**
ECOLOGY AND EVOLUTION- Principles and Applications of Environmental biology. ecological succession, ecological niche, Animal relationships, Interspecific- Antagonism, symbiosis, Parasitism, Mutualism, commensalisms. Lamarckism, Darwinism, mimicry, Fossil and Fossilization.

Books for reference:

INVERTEBRATES AND CHORDATES:

1. EkambaranathaAyyar&T.N.Ananthkrishnan (1992) Manual of Zoology Vol – I, part I & II S.ViswanathanPvt. Ltd. Chennai.
2. Jordan.E.L&P.S.Verma (2000) 'Chordate Zoology' S.Chand& Co New Delhi.

CYTOLOGICAL TECHNIQUES AND HUMAN GENETICS:

1. Verma.P.S and Agarwal.V.K (2004) Genetics, S.Chand& Co., New Delhi
2. Dalela.R.C and Verma.S.R (1970) A Textbook of Genetics, JaiprakashNath and Company., Meerut.
3. Max Levitan Tex Book of Human Genetics - Oxford University Press.

DEVELOPMENTAL BIOLOGY

1. Verma.S and AgarwalV.K(2000) Chordate Embryology S.Chand& Co. New Delhi.
2. Balinsky.B.I (1981) An Introduction to Embryology S.Chand& Co. New Delhi.
3. Saunders.J.W (1982) Developmental Biology – Pattern and Principles, Macmillan New York.

ECOLOGY AND EVOLUTION

1. Text book of Ecology & Animal Distribution by P.S.VermaV.K.AgarwalS.Chand& Co. New Delhi.
2. OdumE.P.Basic Ecology (1983) Saunders College Publishing's New York.
3. Arumugam.N (2002) Organic Evolution, Saras Publication., Nagercoil.

II B.Sc (Biochemistry)	ADVANCED ZOOLOGY- PRACTICAL	AZBP401
SEMESTER - IV		HRS/WK – 3
ALLIED PRACTICAL		CREDIT -2

MAJOR PRACTICALS

1. Dissection of digestive system and body setae in earthworm.
2. Prawn- Appendages
3. Estimation of Unit metabolism of fish.

MINOR PRACTICALS

1. Squash preparation of onion root tip for mitosis.
2. Human pedigree construction for a family data.
3. Mouth parts- Honey bee and Mosquito.

SPOTTERS

T.S. of Chick embryo- 24hrs, 48hrs, 72hrs and 96hrs, *Taeniasolium*, Placoid scale, T.S. of Pituitary gland, Adrenal gland, Thyroid gland, Testis and Ovary.

QUESTION PAPER PATTERN

Continuous Internal Assessment (CIA) 25marks

1. Two Internal Examinations	15 marks
2. Assignment/ Seminar	5 marks
3. Attendance	5 marks

Total **25 marks**

Semester Examination (75 marks)

Time: 3Hrs

Max. Marks: 75

A Question paper consists of three parts

Part-A

10 very short answer questions without choice. Each question is to be answered in about 50 words. Two questions from each unit. Each answer is to be valued out of 2 marks.

Part-B

5 questions are to be answered in either or type. Each question is to be answered in about 300 words. Two questions from each unit. Each answer is to be valued out of 5 marks.

Part-C

3 questions are to be answered out of 5 questions given, one question from each unit to be answered in about 1000 words. Each answer is to be valued out of 10 marks.

Part-A

Very Short Answers (50 words) 10 questions each 2 marks. (10x2=20 Marks)

Part-B

Short Answers (300 words) 5 question each 5 marks. (5x5=25 Marks)

Part-C

Essay questions (1000 words) 3 questions each 10 marks. (3x10=30 Marks)

TOTAL **75 Marks**

PRACTICAL EXAMINATION

Continuous Internal Assessment (CIA) (40 marks)

Based on the periodical evaluation of Record, Observation record and Experiments assessed by the staff incharge.

External Examination (60 marks)

Time: 3 Hrs

Practical	- 50 marks
Record	- 10 marks
Total	- 60 marks

II YEAR	ENVIRONMENTAL SCIENCE	EVS301S/ EVS401S
SEMESTER – III/IV		HRS/WK – 3
AEC		CREDIT – 2

(For All UG II Year Students Any One Semester)

Objective:

The need for sustainable development is a key to the future of mankind.

Course Outcomes (CO's):

On completion of the course students will be able

CO1: To understand the natural environment and its relationships with human activities.

CO2: To demonstrate an awareness and knowledge of the intrinsic values of ecological system.

CO3: To characterize and analyze human impacts on biodiversity and its conservation.

CO4: To demonstrate an ability to integrate the many disciplines and fields that intersect with environmental concerns

CO5: To integrate knowledge and to analyze, evaluate and manage the different public health aspects of disaster events at local and global levels.

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER III/IV	COURSE CODE: EVS301S/ EVS401S					COURSE TITLE: ENVIRONMENTAL SCIENCE										HOUR S: 3	CRED ITS:2
	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)											
COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	3	4	4	5	5	5	2	3	5	1	5	5	5	4.1	
CO2	5	5	3	4	4	5	5	5	2	3	5	1	5	5	4	4.1	
CO3	5	5	3	4	4	5	5	5	2	4	5	1	5	5	3	4.1	
CO4	5	5	3	4	4	4	5	4	2	4	5	1	5	5	3	4.0	
CO5	5	5	3	4	4	4	5	4	2	4	5	1	5	5	5	4.1	
Mean Overall Score																4.1	

Result: The Score of this Course is 4.1 (Very High)

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

UNIT I : ENVIRONMENTAL STUDIES AND NATURAL RESOURCES: 9 Hours

Definition, scope and importance of environmental studies – forest resources: deforestation, mining, dams – water resources: over – utilization, floods, drought – mineral resources: exploitation, extraction and usage – food resources: food problems, overgrazing, pesticide problems, water logging, salinity – energy resources: energy needs, renewable and non renewable energy – land resources: land degradation, landslides, soil erosion and desertification – conserving natural resources.

UNIT II: ECOSYSTEM: 9 Hours

Concept, structure and function of an ecosystem – producers, consumers and decomposers – energy flow – ecological succession – food chains, food webs and ecological pyramids – types, characteristics, structure and function of forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem –

UNIT III: BIODIVERSITY: 9 Hours

Definition of biodiversity – genetic, species and ecosystem diversity – value of biodiversity – India as a mega diversity nation – hot spots – threats to biodiversity – endangered and endemic species of India – In-situ and Ex-situ conservation of biodiversity.

UNIT IV: ENVIRONMENTAL POLLUTION: 9 Hours

Cause, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution and nuclear hazards – solid waste management: causes, effects, control measures and disposal of wastes – disaster management: floods, earthquakes, cyclone, land slides and tsunami.

UNIT V:**SOCIAL ISSUES, HUMAN POPULATION AND THE ENVIRONMENT: 9Hours**

Water conservation, rain water harvesting, watershed management – environmental ethics: issues and possible solution – climate change, global warming, acid rain, ozone depletion, nuclear accidents and holocaust – wasteland reclamation – Environment protection Act – Wildlife protection Act – Forest Conservation Act – public awareness – Population explosion – Environment and human health – Role of Information Technology in Environment and human health.

Field work:

1. Visit to a local area to document environmental assets – river / forest / grassland/mangrove.
2. Visit to a local polluted site – urban / rural / industrial / agricultural.
3. Study of common plants, insects, birds.
4. Study of simple ecosystems – pond, river, forest, etc.,
5. Practical work

Reference Books:

1. Joseph C.Daniel,2004. Principles of Environmental Science. Brightson's Publications,Chennai.
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India, Email:mapin@icenet.net

4. Jadhav, H &Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi
5. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co.
6. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA,
7. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
8. 8. Trivedi R.K., Hand book of Environmental Laws, Rules Guidelines, Compliances and Standards. Vol I and II, Enviro Media9.Wanger K.D., 1998. Environmental Management. W.B. Saunders Co. Philadelphia, USA

II YEAR	ENVIRONMENTAL SCIENCE	EVST301S
SEMESTER – III		HRS/WK – 3
AEC		CREDIT – 2

(For B.A., Tamil II Year Students)

சுற்றுச் சூழல் அறிவியல்

Unit/அலகு-1 சுற்றுச் சூழியல் மற்றும் இயற்கை வளங்கள்

சுற்றுச் சூழல் இயலின் இலக்கணம், நோக்கம், முக்கியத்துவம் - காடும் அதன் வளங்களும், காடுகள் அழிப்பு, சுரங்கம், நீர் தேக்க அணை - நீர் ஆதாரங்கள், பயன்பாடுகள், வெள்ளம், வறட்சி, கனிம வளங்கள் - சுரண்டல், அளவாக எடுத்தல் (ம) பயன்பாடு உணவு வளங்கள் - உணவும் அதன் நிறை குறைகளும், அதி தீவிர மேய்ச்சல், பூச்சுக்கொல்லி (ம) உயிர்கொல்லியின் குறைகள், நீர் தேங்குதல், உப்புத்தன்மை, சக்தி வளங்கள் - சக்தியின் தேவைகள், புதுப்பிக்க கூடிய (ம) புதுப்பிக்க இயலாத சக்திகள் நில வளங்கள் - நிலவளக் குறைவு, நிலச்சரிவு, மண்சரிவு மற்றும் பாலைவனமாகுதல், இயற்கை வளங்களின் பாதுகாப்பு நன்மைகளும்.

Unit/அலகு-2 சூழல்நிலை மண்டலங்கள்

கோட்பாடு, அமைப்பு மற்றும் செயல்பாடு உற்பத்தியாளர்கள், நுகர்வோர்கள் மற்றும் சிதைப்பவர்கள் - சூழ்நிலை மண்டலத்தின் ஆற்றல் ஓட்டம் சூழியல் வழிமுறை வளர்ச்சி, உணவுச்சங்கிலி, உணவுவளை, சூழ்நிலை மண்டலங்கள் வகைகள், தன்மைகள், அமைப்பு மற்றும் செயல்பாடு - காட்டு சூழ்நிலை மண்டலம், புல்வெளி சூழ்நிலை மண்டலம், பாலைவனம் மற்றும் நீர்ச்சூழ்நிலை மண்டலம்.

Unit/அலகு-3 உயிரியப் பல்வகைமை

வரையறை, வகைகள், உயிரியப் பல்வகைமையின் பயன்கள், இந்தியா ஓர் உயிரியமிகை பல்வகைமை மண்டலம், உயிரியமிகை பல்வகைமை இடங்கள், உயிரியல் பல்வகைமைக்கு அச்சுறுத்தல், உயிரிய பல்வகைமையின் பாதுகாப்பு.

Unit/அலகு-4 சுற்றுச்சூழல் மாசுபாடு

காற்று மாசுபாடு, நீர் மாசுபாடு, மண் மாசுபாடு, கடல் மாசுபாடு, இரைச்சல் மாசுபாடு, அனல் மாசுபாடு மற்றும் கதிரியக்க மாசுபாடு - திடகழிவு மேலாண்மை, காரணிகள், விளைவுகள், தடுக்கும்முறை மற்றும் பாதுகாப்பான அப்புறப்படுத்தும் முறை பேரிடர் மேலாண்மை, வெள்ளம், நிலநடுக்கம், புயல், நிலச்சரிவு மற்றும் ஆழிப்பேரலைகள்.

Unit/அலகு-5 சமூக சிக்கல்களும் மக்கள் பெருக்கமும் சுற்றுச்சூழலும்

நீர்வள பாதுகாப்பு, மழைநீர் சேகரிப்பு, நீர்வள மேலாண்மை - சுற்றுச்சூழல் வரைமுறை சிக்கல்களும் அதன் நீர்க்கும் காரணிகளும், வானிலை மாற்றங்கள், உலகவெப்பமயமாதல், அமிலமழை, ஓசோன் சிதைவு, கதிரியக்க விபத்துகள் மற்றும் பேரிடர்கள் நீர்பிரிகை முகடு சீரமைப்பு, சுற்றுச்சூழல் பாதுகாப்பு சட்டம், வன உயிரினப் பாதுகாப்பு சட்டம், வனப்பாதுகாப்பு சட்டம், சுற்றுச்சூழல் விழிப்புணர்வு, மக்கள் தொகைப் பெருக்கம், சுற்றுச்சூழல் (ம) மனித நலன் - மனித நலனிலும், சுற்றுச் சூழலிலும் தகவல் தொழில் நுட்பத்தின் பங்கு.

**QUESTION PAPER PATTERN
(For Environmental Science)**

THEORY EXAMINATION

Continuous Internal Assessment (CIA) 25 marks

1. Two Internal Examinations	15 marks
2. Assignment/ Seminar	5 marks
3. Attendance	5 marks

Total **25 marks**

Semester Examination (75 marks)

Time: 3Hrs

Max. Marks: 75

A Question paper consists of three parts

Part-A

20 choose the answer question. Each answer is to be valued out of 1 marks.

Part-B

5 questions are to be answered in either or type. Each question is to be answered in about 300 words. Two questions from each unit. Each answer is to be valued out of 5 marks.

Part-C

3 questions are to be answered out of 5 questions given, one question from each unit to be answered in about 1000 words. Each answer is to be valued out of 10 marks.

Part-A

Choose the answer 20 questions each 1 mark. (20x1=20 Marks)

Part-B

Short Answers (300 words) 5 question each 5 marks. (5x5=25 Marks)

Part-C

Essay questions (1000 words) 3 questions each 10 marks. (3x10=30 Marks)

Field work

TOTAL

75 Marks

II UG	NON MAJOR ELECTIVE ORNAMENTAL FISH CULTURE	CODE: 4N ZO FC
SEMESTER - IV		HRS/WK - 3
NME		CREDIT - 2

Objectives:

- To impart training on Ornamental fish culture technology.
- To create knowledge on self employment opportunity.

UNIT – I

The potential scope of Ornamental fish culture as a Cottage Industry. Exotic and Endemic species of Aquarium Fishes.

UNIT – II

Common characters and sexual dimorphism of Fresh water and Marine Ornamental fishes such as Guppy, Molly, Sword tail, Gold fish, Angel Fish, Blue Morph, Anemone fish and Butterfly fish.

UNIT – III

Food and feeding of Ornamental fishes – use of live fish feed organisms. Preparation and composition of formulated fish feeds.

UNIT – IV

Live fish transport – Fish handling, packing and forwarding techniques.

UNIT – V

General Aquarium maintenance – budget for setting up an aquarium fish farm as a cottage industry.

Text Books:

1. Jingaran V.G., 1991: Fish and fisheries in India – Hindustan Publ. co New Delhi – India.
2. Yadav. 1995: Fish and fisheries, Daya publ. co., New Delhi – India

Reference Books:

1. Shanmugam K. 1992, Fishery Biology and Aqua Culture – Leo Pathipagam – Chennai- India.
2. Mill Dick, 1993: Aquarium fish, DK Publ.Co,Inc. New York –USA
3. Hall, C.B. 2005: Ponds and Fish culture – Agrobios – Jodhpur – India.
4. Day,F. 1978: Fishes of India Vol. I & II, William Danisan& Sons, India.

QUESTION PATTERN

Written paper Max Marks: 75 Marks

Time:3 Hours

A Question paper consists of three parts

Part-A

20 Choose the Answer Questions. Equal representation to be given to all the units. Each answer is to be valued out of 1 mark.

Part-B

5 questions are to be answered in either or type. Each question is to be answered in about 300 words.

Part-C

3 questions are to be answered out of 5 questions given, one question from each unit to be answered in about 1000 words. Each answer is to be valued out of 10 marks.

Part-A

Choose the answer 20 questions each 1 mark.

Part-B

Short Answers (300 words) 5 question each 5 marks.

Part-C

Essay questions (1000 words) 3 questions each 10 marks

VALUE ADDED COURSE

DEPARTMENT	VERMICOMPOSTING	CODE
ZOOLOGY		VAZL02

FOR UG STUDENTS

Unit I: INTRODUCTION (6 Hours)

Earthworm- structures, Geographical distribution, Classification based on habitat, (i) epigeics, (ii) anecics and (iii) endogeics.

Unit II: IDENTIFICATION (6 Hours)

i) Cocoon ii) Juvenile iii) Adult iv) Species v) Burrowing vi) Feeding vii) Casting.

Unit III: SPECIES SUITABLE FOR VERMICOMPOSTING (6 Hours)

Species Advocated for Vermicomposting, Species used in India

Unit IV: CONVENTIONAL STEPS INVOLVED IN VERMICOMPOSTING (6 Hours)

Steps of vermicomposting set up, Vermibed preparation, Management,

Unit V: VERMICAST (6 Hours)

Practical –and harvesting techniques of vermicast, Marketing of vermicompost.

REFERENCES:

1. S. Gajalakshmi, Indian Journal of Biotechnology Vol 3, October 2004, pp 486-494.
2. T. Ganeshkumar, Lambert Academic Publishing, 2013.
3. T. Ganeshkumar, Bioresources and Bioprocessing, 2014, 1:26.

DEPARTMENT	MUSHROOM CULTIVATION TECHNIQUES	COURSE CODE
ZOOLOGY		VAZL01

OBJECTIVES

1. To emphasize the importance of integrating new knowledge of foods.
2. To update the technological innovations of edible mushrooms and improve the self employability.

UNIT – I : INTRODUCTION (6 Hours)
Introduction – Scope – Advantages- General Characters – Types of Mushrooms.

UNIT – II : IDENTIFICATION (6 Hours)
Identification of Edible and Poisonous Mushroom – Mushroom Poisoning.

UNIT – III : CULTURE TECHNIQUES (6 Hours)
Mushroom Culture – Type: Oyster Mushroom (*Pleurotus ostreatus*) – Spawn Production Techniques – Bed Preparation – Harvesting.

UNIT – IV : PROCESSING (6 Hours)
Preservation of Mushrooms – Value added mushroom products – Precaution of mushroom cultivation

UNIT – V : ECONOMIC VALUE (6 Hours)
Economic importance – Marketing and self employable aspects of mushroom cultivation- practical's

REFERENCES,

1. Kumarasan, V. 2001 : Biotechnology Saras Publication, Nagargoil.
2. Dubey, R.C.2006 : A text book of Biotechnology, S. Chand & Co, India..
3. Suman, B.C. 2007: Mushroom production, Processing and uses agrobios, India.
4. Pathak, V.N. 2007: Mushroom production and processing Technology – Agrobios, India.
5. Sharma, V.P.2006: Diseases and pests of mushrooms Agrobios, India.