

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

**CUDDALORE-1**



**DEPARTMENT OF ZOOLOGY**

**SYLLABUS 2019-2020**

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CUDDALORE-1**

**DEPARTMENT OF ZOOLOGY**

**SYLLABUS 2019-2020**

**DETAILS OF THE BOARD OF STUDIES (2019-2020)**

**NAME OF THE BOARD : UG Board**

<b>S. No</b>	<b>Category</b>	<b>Name</b>	<b>Affiliation</b>	<b>Term</b>
1.	Chairman	Dr. P. Thenmozhi	Asst. Professor & Head, Department Of Zoology St. Joseph's College Arts & Science Cuddalore-1	
2.	University Nominee	Dr. R. Kannan	Prof and Head & Department of Zoology, Perriyar Govt. Arts. College, Cuddalore-1	3 Years
3.	Subject Experts	1. Dr. G. Gunasekaran	Professor Department of Zoology Annamalai University, Chidambaram	
		2. Dr.M.Thirumavalavan	Associate Professor Dept of Zoology Bharadthidasan College of Arts & Science for Women, Pondicherry.	
4.	Members (Internal)	1. Dr. A. Arulprakash	Asst. Professor Department of Zoology St. Joseph's Arts&Science Cuddalore-1	
		2. Dr. T. Ganeshkumar	Asst. Professor Department of Zoology St. Joseph's Arts&Science Cuddalore-1	
		3. Dr.N.Jayaprabha	Asst. Professor Department of Zoology St. Joseph's Arts&Science Cuddalore-1	

## DEPARTMENT OF ZOOLOGY

## MINUTES OF THE BOARD OF STUDIES

The board of studies meeting for the Academic year 2019-20 was conducted in the Department of Zoology on **13.03.2019** at **10.30 am.** in the presence of the University Nominee **Dr. R. Kannan**, Asst. Professor & Head, Department of Zoology, Periyar Arts College, Cuddalore, The Subject Experts **Dr. G. Gunasekaran**, Professor, Department of Zoology, Annamalai University, Chidambaram, **Dr. M. Thirumavalavan**, Associate Professor, Dept of Zoology, Bharathidasan College of Arts & Science for Women, Pondicherry. **Mrs. P. Thenmozhi**, Asst. Professor & Head, Department of Zoology, St. Joseph's College Of Arts & Science (Autonomous) Cuddalore, **Dr. A. Arulprakash**, Asst. Professor, Department of Zoology, St. Joseph's College Of Arts & Science (Autonomous) Cuddalore and **Mr. T. Ganeshkumar**, Asst. Professor, Department of Zoology, St. Joseph's College Of Arts & Science (Autonomous) Cuddalore and **Dr. N. Jayaprabha**, Asst. Professor, Department of Zoology, St. Joseph's College Of Arts & Science (Autonomous) Cuddalore. Various discussions and suggestions were carried out regarding the syllabus and the curriculum for I B.Sc., Zoology, II B.Sc., Zoology, II B.Sc., Biochemistry (Allied), II B.Sc., Microbiology (Allied).

The following changes and resolutions were made in the board of studies meeting for I B.Sc., Zoology.

In order to facilitate the students to learn more number of allied papers, four different allied papers have been allotted viz Botany for 1<sup>st</sup> semester, Chemistry for 2<sup>nd</sup> semester, Biochemistry for 3<sup>rd</sup> semester and Microbiology for 4<sup>th</sup> semester. With regard to the forthcoming 1<sup>st</sup> year B.Sc., curriculum was resolved that to split the core papers into core paper –I and core paper-II to maintain uniformity in the college general curriculum.

The following resolutions were made in the board of studies meeting for the II B.Sc., Zoology syllabus.

Allied Biochemistry for 3<sup>rd</sup> semester as allied, allied Botany for 4<sup>th</sup> semester and skill based course for semester 4<sup>th</sup> will be basics of computer science.

No other modifications were suggested by the subject experts.

With regard to the allied papers given by the Department few recommendation and changes have been made.

For II B.Sc., Microbiology, III semester allied paper classical genetics and biostatistics with the optional paper Allied Laboratory Animal Care have been converted into five theory classes with three practical hours from full theory paper will be effect from the academic year 2020-21. Since the theory hours have been reduced, few topics were deleted Viz.

**Unit 1.** Mendel's experiments: polyhybrid cross - Mendel's laws of inheritance - hybrid vigour – gene expressivity - pleiotropism – incomplete dominance – complementary genes,

supplementary genes – duplicate genes, continuous and discontinuous characters. Characters and theories of multiple alleles – sub alleles and iso alleles, history - linked genes – complete and incomplete linkage – significance of linkage.

**Unit 2.** Stage specificity - cytological evidence – frequency of crossing over – factors controlling crossing over, gene function.

**Unit 3.** nucleic acids, enzyme relationship, human chromosomes

**Unit 4.** Importance – Functions – Data – Classification of Data – Tabulation of Data – Measures of dispersion – range – quartile deviation and coefficient of variation –

**Unit 5.** Permutation and combinations, alternative hypothesis

For II B.Sc., Microbiology, IV semester allied paper is Applied Entomology with Solid Waste Management as optional paper. New syllabus have been framed for Applied Entomology and was approved by the board members.

For II B.Sc., Biochemistry, IV semester already existing allied paper name is changed from Advanced Zoology into Allied Zoology. After a long discussion the syllabus was modified slightly for enhancing the quality of the paper in par with their main paper.

In Unit II, the already existing unit physiology has been changed into chordates

In Unit III, The heading Molecular Biology and Human Genetics have been changed in to Cytological techniques and Human Genetics.

In Unit V, The topic dating of Fossils have been deleted and some of the topics have been included viz: Darwinism, Lamarckism and Mimicry.

It was resolved that to retain the existing syllabus and the curriculum without any addition ,deletion or modifications for II B.Sc. Microbiology allied papers for the forthcoming academic year 2019-20.

With the above resolutions the meeting was concluded at about 1.40 p.m.

## B.Sc. ZOOLOGY DEGREE COURSE

**CURRICULUM DESIGN TEMPLATE (TENTATIVE)**  
**B. Sc. Zoology – Course of study and Scheme of Examinations**  
 (With effect from 2019 - 2020)

SEMESTER	SUBJECT CODE	SUBJECT	PAPER	HOURS	CREDITS	EXAM HOURS	MARKS
I	LE101T	English – I		4	3	3	100
	LT101T	Language – I		4	3	3	100
	19ZO101	Core – I	Invertebrata –I	4	3	3	100
	19ZO102	Core –II	Invertebrata –II	4	3	3	100
	18ZOP21	Core Practical – I	Practical - I Invertebrata and Chordata	3	-	-	100
	19ABZ101	Allied - I (Compulsory)	Allied Botany	5	4	3	100
	19ABP101	Allied Botany	Allied Botany Practical – I	3	2	3	100
	19AEC101	AEC-English Communication	English Communication	1	1	2	100
	VE101T	Skill Enhancement Course(SEC)	Value Education	2	2	2	
			Total for Semester I		<b>30</b>	<b>21</b>	
II	LT202T	English – II		4	3	3	100
	LE202T	Language – II		4	3	3	100
	19ZO203	Core – III	Chordata-I	4	3	3	100
	19ZO204	Core – IV	Chordata-II	4	3	3	100
	18ZOP21	Core Practical – I	Practical – I Invertebrata and Chordata (Contd.)	3	4	3	100
	19ACH202	Allied – II (Compulsory)	Chemistry	5	4	3	100
	19ACP202	Allied Chemistry	Chemistry Practical – I	3	2	3	100
	19AEC202	AEC-English Communication	English Communication	1	1	2	100
	EPD201T	Skill Enhancement	Dynamics of Personality	2	2	2	

**Syllabus 2019-2020**

**Zoology**

		Course(SEC)					
		Total for Semester II		<b>30</b>	<b>25</b>		
<b>III</b>	LE303T	<b>English – III</b>		4	3	3	100
	LT303T	<b>Language – III</b>		4	3	3	100
	19ZO305	<b>Core – V</b>	Cell Biology	4	3	3	100
	19ZO306	<b>Core – VI</b>	Molecular Biology	4	3	3	100
	19ZOP42	Core Practical – II	<b>Practical – II</b> Cell and Molecular biology, Genetics and Biotechnology	3	-		
	19ABC303	<b>Allied - III (Elective)</b>	Allied Biochemistry	5	4	3	100
	19ABP303	<b>Allied Practical</b>	Biochemistry Practical – III	3	2	3	100
	EVS301S	<b>Ability Enhancement Course(AEC)</b>	Environmental Studies	3	2	3	100
			<b>Total for Semester III</b>		<b>30</b>	<b>20</b>	
<b>IV</b>	LE404T	<b>English – IV</b>		4	3	3	100
	LT404T	<b>Language – IV</b>		4	3	3	100
	19ZO407	<b>Core – VII</b>	Genetics	4	3	3	100
	19ZO408	<b>Core – VIII</b>	Biotechnology	4	3	3	100
	19ZOP42	<b>Core Practical – II</b>	<b>Practical – II</b> Cell and Molecular biology, Genetics and Biotechnology <b>(Contd.)</b>	3	4	3	100
	19AMB404	<b>Allied –IV (Elective)</b>	Allied Microbiology	5	4	3	100
	19AMP404	<b>Allied Practical – IV</b>	Allied Microbiology Practicals	3	2	3	100
	19ACS401	<b>Skill Based Courses (Optional)</b>	<b>1</b>	<b>Basic of Computer and its application</b>	3	2	3

**Syllabus 2019-2020**

**Zoology**

			2	Apiculture				
		<b>Total for Semester IV</b>			<b>30</b>	<b>24</b>		
<b>V</b>	20ZO509	<b>Core – IX</b>	Biostatistics and computational Biology		5	4	3	100
	20ZO510	<b>Core – X</b>	Developmental Biology and Immunology		5	4	3	100
	20ZO511	<b>Core – XI</b>	Animal Physiology		5	4	3	100
	20EZ512A	<b>Elective – I [Compulsory]</b>	<b>Applied Entomology</b>		5	4	3	100
	20EZ513A	<b>Elective – II [Optional]</b>	A	<b>Biofertilizer Production</b>	4	3	3	100
	20EZ513B		B	Public Health and hygiene				
			C	Biochemistry				
	20ZOP63	<b>Core Practical – III</b>	Animal Physiology, Developmental Biology and Immunology		3	-		100
	20ZOP64	<b>Core Practical – IV</b>	Environmental Biology, Economic Zoology and Evolution		3	-		100
				Skill Development Course e course-		2	2 (Extra credit)	2
			SSC-Self Study Course					
		<b>Total for Semester V</b>			<b>30</b>	<b>19</b>		
<b>VI</b>	20ZO614	<b>Core – XII</b>	Environmental Biology		5	4	3	100
	20ZO615	<b>Core – XIII</b>	Economic Zoology		5	4	3	100
	20ZO616	<b>Core – XIV</b>	Evolution		5	4	3	100
	20EZ617A	<b>Elective – III [Compulsory]</b>	<b>Aquaculture</b>		5	4	3	100
	20EZ618A	<b>Skill based subject[optional]</b>	A	<b>Bioinstrumentation</b>	4	3		
	20EZ618B		B	Sericulture				
	C		Biophysics					

**Syllabus 2019-2020****Zoology**

	20ZOP63	<b>Core Practical – III</b>	Animal Physiology and Developmental Biology and Immunology <b>(Contd.)</b>	3	5	3	100
	20ZOP64	<b>Core Practical – IV</b>	Environmental Biology, Economic Zoology and Evolution <b>(Contd.)</b>	3	5	3	100
	XJZO601	<b>Project work</b>			2 (Extra credit)		
	EU601	<b>Extension Activities</b>			2		
		<b>Total for Semester VI</b>		<b>30</b>	<b>31</b>		
		<b>Total Credits</b>			<b>140</b>		



## 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,

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.

**PSO6: Cooperation/Team work**

The students will be able to work effectively and respectfully with diverse team during vermiculture and mushroom culture practices

**PSO7: Information/digital literacy**

The students will be able to use various biological softwares to analyze the data by obtaining knowledge in biostatistics, computational biology and biotechnology.

**PSO8: Self-directed learning**

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.

**PSO9: Moral and ethical awareness/reasoning**

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.

**PSO10: Lifelong learning**

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.

## COURSE OUTCOME

I B.Sc (Zoo)	INVERTEBRATA-I	19ZO101
SEMESTER - I		HRS/WK – 4
CORE - I		CREDIT – 3

**Objective:**

- Enlightening the knowledge classification of animals by understanding the basic concepts of biosystematics
- To identify invertebrates and classify them up to the classes with the basis of systematic

**Course Outcome**

On completion of the course students will be able

**CO1:** To describes the principles of taxonomy and classification of animal kingdom

**CO2:** To identify the phylum Porifera with taxonomic keys

**CO3:** To classify the phylum Helminthes upto classes with examples

**CO4:** To classify the phylum Arthropoda upto classes with examples

**CO5:** To describe the phylum Mollusca and their economic importance

SEMESTER I	COURSE CODE: 19ZO101					INVERTEBRATA-I										HOURS: 4	CREDITS: 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	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	

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

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

**UNIT – I**

**Principles of Taxonomy** – Binomial nomenclature-rules of nomenclature – classification of the animal kingdom.

**UNIT – II**

**PORIFERA:** General characters and classification upto classes with examples. **Type study - sycon**, spicules and canal system in sponges.

**UNIT – III**

**HELMINTHES:** General characters and classification upto classes with examples.

**UNIT – IV**

**ARTHROPODA:** General characters and classification upto classes with examples.

**UNIT – V**

**MOLLUSCA:** General characters and classification upto classes with examples.

**Type study – Fresh water Mussel**, Economic importance of mollusca, torsion in mollusca.

**Reference Books:**

1. Ekambaranatha Ayyar.M. and T.N. Ananthakrishnan, 1992. Manual of Zoology Vol.1 [Invertebrata], Viswanathan [Printers and Publishers] Pvt. Ltd.; Madras.
2. Jordan, E.L. and P.S.Verma, 1993. Invertebrate Zoology, 12th Edition. S.Chand and Co.Ltd., NewDelhi.
3. Kotpal, R.L. 1988-1992 Protozoa, Porifera, Coelenterata, Helminthes, Annelida, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.
4. Parker and Haswell, 1964 Test Book of Zoology. Vol.1 [Invertebrata]. A.Z.T; B.S.Publishers and distributors, New Delhi.
5. L.A Borrardile and F.A.Pott, 1972 The Invertebrates. Cambridge University Press. UK.
6. Adam Sedgwick. A student text book of Zoology. Vol.I and II. Central book Depot. Allahabad.
7. P.S.Dhami and J.K.Dhami. 1969 Invertebrate Zoology, S.Chand and Co. New Delhi.
8. Hyman L.H. The Invertebrate Vol.I-IV. 1955, McGraw Hill Co. New York.
9. Barrington, E.J.W.. Invertebrate structure and function. ELBS Publication.
10. Barnes. Invertebrate Zoology. Toppan International Co.

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks  
Time :3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

<b>I B.Sc (Zoo)</b>	<b>INVERTEBRATA-II</b>	<b>19ZO102</b>
<b>SEMESTER - I</b>		<b>HRS/WK – 4</b>
<b>CORE - II</b>		<b>CREDIT – 3</b>

**Objective:**

- To study the diverse form of invertebrates
- To acquire knowledge about causes and symptoms of some protozoan diseases
- To study parasitic adaptations of annelids and significance of Crustacean and Echinoderm larvae

**Course Outcome**

On completion of the course students will be able

**CO1:** To understand the phylum protozoa and the diseases caused by them

**CO2:** To know the classification and polymorphism in coelenterata and coral reefs

**CO3:** To describe the classification of Annelida and their parasitic adaptations

**CO4:** To understand arthropoda, affinities of peripatus and importance of Crustacean larvae.

**CO5:** To classify Echinodermata upto classes and to describe the significance of their larvae

SEMESTER I	COURSE CODE: 19ZO102					INVERTEBRATA-II										HOURS: 4	CREDITS :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	5	5	5	5	4	4	4	3	4	4	5	4.4	
CO2	5	5	4	4	5	5	5	5	4	4	4	3	4	4	5	4.4	
CO3	5	5	4	4	5	5	5	5	4	4	4	3	4	4	5	4.4	
CO4	5	5	4	4	5	5	5	5	4	4	4	3	4	4	5	4.4	
CO5	5	5	4	4	5	5	5	5	4	4	4	3	4	4	5	4.4	
Mean Overall Score																4.4	

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

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

**UNIT – I**

**PHYLUM PROTOZOA:** Type study- **paramecium**, parasitic protozoans [Entamoeba, Trypanosoma and plasmodium]

**UNIT – II**

**COELENTERATA:** General characters and classification upto classes with examples. **Type study – Obelia**, polymorphism in coelenterates – corals and coral reefs.

**UNIT – III**

**ANNELIDA:** General characters and classification upto classes with examples. **Type study: Earthworm**, metamerism in Annelids, parasitic adaptations of Leech.

**UNIT – IV**

**ARTHROPODA:** Type study – **Prawn**, Peripatus and its affinities, Mouth parts of insects. Crustacean larvae and their importance.

**UNIT – V**

**ECHINODERMATA:** General characters and classification upto classes with examples. **Type Study- Star fish**, Echinoderm larvae and their significance.

**Reference Books:**

11. Ekambaranatha Ayyar.M. and T.N. Ananthakrishnan, 1992. Manual of Zoology Vol.1 [Invertebrata], Viswanathan [Printers and Publishers] Pvt. Ltd.; Madras.
12. Jordan, E.L. and P.S.Verma, 1993. Invertebrate Zoology, 12th Edition. S.Chand and Co.Ltd., NewDelhi.
13. Kotpal, R.L. 1988-1992 Protozoa, Porifera, Coelenterata, Helminthes, Annelida, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.
14. Parker and Haswell, 1964 Test Book of Zoology. Vol.1 [Invertebrata]. A.Z.T; B.S.Publishers and distributors, New Delhi.
15. L.A Borradiel and F.A.Pott, 1972 The Invertebrates. Cambridge University Press. UK.
16. Adam Sedgwick. A student text book of Zoology. Vol.I and II. Central book Depot. Allahabad.
17. P.S.Dhami and J.K.Dhami. 1969 Invertebrate Zoology, S.Chand and Co. New Delhi.
18. Hyman L.H. The Invertebrate Vol.I-IV. 1955, McGraw Hill Co. New York.
19. Barrington, E.J.W.. Invertebrate structure and function. ELBS Publication.
20. Barnes. Invertebrate Zoology. Toppan International Co.

<b>II B.Sc (Zoo)</b>	<b>BOTANY</b>	<b>19ABZ101/19ABZ404</b>
<b>SEMESTER – I &amp; IV</b>		<b>HRS/WK – 5</b>
<b>ALLIED BOTANY</b>		<b>CREDIT – 3</b>

**Objective:**

- To teach of basic idea of plant science through traditional disciplines such as plant taxonomy, anatomy, morphology, physiology, embryology, genetics, evolution and ecology.

**Course Outcome**

On completion of the course students will be able

**CO1:** To understand the taxonomy of plants

**CO2:** To describe anatomy of prokaryotic and eukaryotic plant cells.

**CO3:** To understand plant physiology and embryology

**CO4:** To describe Structure and life history of some plant species

**CO5:** To acquire knowledge on plant genetics, evolution and ecology

SEMESTER I & IV	COURSE CODE: 19ABZ101/19ABZ404					BOTANY										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	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	

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

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



**UNIT –I : Taxonomy**

General outline of Bentham and hooker's system of classification. Bacteria-general characters-shape-flagellation-structure of E.coli –reproduction, economic importance structure of TMV and Bacteriophage-study of the characters and the economic important of the following families Curcubitaoae, Apocynaceae, Euiperbiaceae and Liliaceous.

**UNIT –II Anatomy**

Prokaryotic and eukaryotic cells[plant cells]-cell organelles –chloroplast, mitochondria and the nucleus – cell divisions- mitosis- tissues- meristomatic and permanent tissues- primary and normal secondary thickening of the dicot stem.

**UNIT –III Plant physiology and Embryology**

Photosynthesis –light reaction- calvin cycle respiration- glycolysis and kerb's cycle-electron transportsystem- growth hormones-Auxins-tissue culture – principles-structure of mature anther-structure of mature ovule-and its types and fertilization.

**UNIT – IV**

Structure and life history of penneccillum, chorella, agaricus, funecia and cycas- economic importance of chorella, peneciellum and agaricus.

**UNIT- V Genetic, Evolution and Ecology**

Mendilism-monoybrid and dihybrid crosses-theories of evolution-Lamarckism and Darwinism-ecosystem- fresh water ecosystem, environmental pollution-types and control measures.

II B.Sc (Zoo)	ALLIED PRACTICAL - IV BOTANY	19ABP101/ 19ABP404
SEMESTER –I&IV		HRS/WK – 3
ALLIED PRACTICAL – IV		CREDIT – 2

Description of plants in technical terms belonging to the families mentioned in the theory part.

To study the internal structure of Anatomy material, Pteridophytes and Gymnosperms.

Identification and Description of Micro Preparation materials mentioned in the theory part.

Description of experimental setup of plant physiology.

### BOOKS SUGGESTED

Ashok Bendre, A.K. and Pandey P.C. (1975) Introductory Botany. Rastogi Publication Meerut.

Ganguly, A.K. and Kumar. N.C. (1971) General Botany Vol. I & Vol. II, Emkay Publication, Delhi.

Rev. Fr. Ignacimuthu, S.J. (1975) Basic Biotechnology – Tata Mcraw till publication co., New Delhi.

Rao, K.N. Krishnamoorthy, K.V. and Rao. G. (1975) Ancillary Botany. S. Viswanathan Private.Ltd., Chennai.

I B.Sc (Zoo)	<b>CHORDATA-I</b>	19ZO203
SEMESTER - II		HRS/WK - 4
CORE - III		CREDIT - 3

**Objective:**

To acquire knowledge on classification of chordates and their characteristic features

**Course Outcome**

On completion of the course students will be able

**CO1:** To describes the salient features and classification of Phylum chordata and their origin

**CO2:** To know classification of phylum Pisces, Accessory respiratory organs and Migration in fishes

**CO3:** To classify the phylum Reptilia and biting mechanism of poisonous snakes

**CO4:** To understand the classification of aves and features of Archaeopteryx

**CO5:** To describe the classification of mammals and egg laying mammals

SEMESTER II	COURSE CODE: 19ZO203					CHORDATA-I										HOURS: 4	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	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	

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

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

**UNIT – I**

**Salient Features and General classification of Phylum chordata upto orders. Origin of Chordata.-**

**UNIT –II**

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

**UNIT – III**

**Class REPTILIA-** General characters and classification upto orders. **Type study – Calotes.** Poison apparatus and biting mechanism of poisonous snakes.

**UNIT – IV**

**Class AVES** - General characters and classification upto orders. Features of Archaeopteryx

**UNIT – V**

**MAMMALIA** - General characters and classification upto orders. Egg laying mammals.

**Reference Books:**

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

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks  
Time :3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

<b>I B.Sc (Zoo)</b>	<b>CHORDATA-II</b>	<b>19ZO204</b>
<b>SEMESTER - II</b>		<b>HRS/WK - 4</b>
<b>CORE - IV</b>		<b>CREDIT - 3</b>

**Objective:**

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

**Course Outcome**

On completion of the course students will be able

**CO1:** To describe the general characters of Prochordates and their affinities

**CO2:** To classify of amphibian and explain their adaptive features and parental care

**CO3:** To get knowledge on identification of snakes and Conservation of turtles and crocodiles.

**CO4:** To describe pigeon and migration and flight adaptation in birds

**CO5:** To define rabbit and dentition in mammals

SEMESTER II	COURSE CODE: 19ZO204					CHORDATA-II										HOURS: 4	CREDITS: 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	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	

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

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

**UNIT – I**

**Sub phylum: Prochordata: Type study: Amphioxus** (Cephalochordata) - General Characters and affinities of - **Balanoglossus** (Hemichordata) & **Ascidian** (Urochordata).

**UNIT –II**

**Class AMPHIBIA** General characters and classification upto orders. **Type study : Frog** - Adaptive features of Anura, Urodela & Apoda. Parental care in Amphibia – Neoteny.

**UNIT – III**

**REPTILIA** : Identification of poisonous and non – poisonous snakes. Conservation of turtles and crocodiles.

**UNIT – IV**

**Type study –Pigeon.** Ratitae, Migration in birds, Flight adaptation.

**UNIT – V**

**Type study – Rabbit.** Dentition in mammals.

**Reference Books:**

8. Ekambaranatha Ayyar, M and T.N Anantha Krishnan 1992, A manual of zoology Vol. II [Chordata]. S. Viswanathan [Printers and publishers] Pvt. Ltd., Madras.
9. Jordan E. L. and P.S. Verma 1995. Chordate Zoology and elements of Animal Physiology. S. Chand and co., New Delhi.
10. Kotpal R.L. 1992. Vertebrata, Rastogi publication, Meerut.
11. Nigam. H.C 1983 Zoology of chordates, Vishal publications, Jalandhar.
12. Waterman, Allyn J.et al. 1971, Chordate Structure and functions, Mac. Millan and co., New York.
13. Jollie. M. 1968. Chordate Morphology. East west press Pvt. Ltd., New Delhi.
14. Hyman. L.H. Comparative vertebrate zoology. McGraw Hill co. New York

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks  
Time :3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks



<b>I B.Sc (Zoo)</b>	<b>CORE PRACTICAL – I INVERTEBRATA AND CHORDATA</b>	<b>18ZOP21</b>
<b>SEMESTER - II</b>		<b>HRS/WK - 3</b>
<b>CORE PRACTICAL – I</b>		<b>CREDIT - 5</b>

**DISSECTIONS**

**Earthworm** – Digestive system

**Cockroach** – Digestive, Nervous system and Reproductive system, **Prawn** – Nervous system, **Fish** – Digestive system

**MINOR PRACTICAL**

**MOUNTING -Insect Mouth parts** : Cockroach, Honey bee, House Fly and Mosquito  
**Prawn** – Appendages, **Shark** - Placoid scales, **Earthworm** – Body setae

**SPOTTERS**

**Study of the following specimens**

**1. Classify by giving reasons**

Paramecium, Sycon, Obelia, Taenia solium, Neries, Prawn, Freshwater mussel, Seastar, Amphioxus, Shark, Hyla, Rhacophorus, Calotes, Pigeon, Rat/Rabbit.

**2. Adaptations to their respective modes of life**

Entamoeba, Trypanosoma, Plasmodium, Corals [any 2], Ascaris, Fasciola, Wuchereria bancrofti, Cheatopterus, Leech, Limulus, Nauplius, Mysis, Zoea, Balanoglossus, Ascidian, Ichthyophis, Draco, sea snake and Bat.

**3. Biological significance:**

Paramecium conjugation and binary fission, physalia, Trochophore Larva, Peripatus, Sacculina On Crab, Sea Anemone on Hermit Crab, Pearl Oyster, Bipinnaria Larva, Anabas, Hippocampus, Narcine, Echeneis, Arius, Exocoetus, Eel, Amblystoma, Axolotl Larva, Bufo, Cobra, Krait, Russels Viper, Echis Carinata, Turtle, Parrot, Woodpecker, King Fisher and Ant eater

**4. Relate structure and function:**

Sponge Spicules, Obelia-Polyp, Taenia-Scolex, Nereis - Parapodium, Book lungs of scorpion/Honey bee sting apparatus, Pedicellaria of Sea star, Ctenoid Scale and Quill Feather of pigeon.

**5. Draw labeled sketches:**

T.S. of Nereis, T.S. of Leech, Obelia medusa, T.S. of Amphioxus through Pharynx, T.S. through arm of Sea star.

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

II B.Sc (Zoo)	<b>CELL BIOLOGY</b>	19ZO305
SEMESTER - III		HRS/WK – 4
CORE - V		CREDIT - 3

**Objective:**

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

**Course Outcome**

On completion of the course students will be able

**CO1:** To understand the Principles of microscopes and Cytological techniques

**CO2:** To describe the structure and functions cell and cell organelles

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

**CO4:** To explain cell cycle and cell division

**CO5:** To obtain knowledge on structure and functions of DNA and types of RNA

SEMESTER III	COURSE CODE: 19ZO305					CELL BIOLOGY										HOURS: 4	CREDITS: 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	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	

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

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

**UNIT – I**

**History of Cell**– Principles of microscopes light and electron, **Cytological techniques** - cell fractionation, Homogenization Centrifugation, Isolation of Sub-cellular components.

**UNIT – II**

**Cell** – Cell theory, Ultra structure of animal cell – structure, composition and functions – cell components – Plasma Membrane – Endoplasmic reticulum.

**UNIT – III**

**Cytoplasm** – Physical, chemical and biological properties. **Nucleus** – Ultrastructure, Composition and Function.

**UNIT – IV**

**Cell cycle and cell division** – Amitosis, Mitosis and meiosis and their significance.

**UNIT – V**

**Structure and functions of DNA & types of RNA** [mRNA, tRNA, rRNA]. Semi conservative replication.

**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. Powar, C.B., 1989. Essentials of Cytology, Himalaya Publishing House, Bombay.
5. Verma, P.S., and V.K. Agarwal, 1995. Cell and Molecular Biology, 8th Edition, S. Chand & Co., NewDelhi.
6. Rastogi. S.C. 2008 Cell and Molecular Biology, 2nd Edition, New Age International (p) Ltd., New Delhi.
7. Jayanthi .G.P. 2009 Molecular Biology, M.J.P Publ. Chennai.

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks

Time :3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

<b>II B.Sc (Zoo)</b>	<b>MOLECULAR BIOLOGY</b>	<b>19ZO306</b>
<b>SEMESTER - III</b>		<b>HRS/WK – 4</b>
<b>CORE - VI</b>		<b>CREDIT - 3</b>

**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 Outcome**

On completion of the course students will be able

**CO1:** To get knowledge on biochemical and cell culture techniques

**CO2:** To understand the cell components

**CO3:** To know chromosomes structure and giant chromosomes.

**CO4:** To realize cancer biology and process of aging

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

SEMESTER III	COURSE CODE: 19ZO306					MOLECULAR BIOLOGY										HOURS: 4	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	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	

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

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

**UNIT – I**

**Biochemical techniques** – Electrophoresis and their applications. **Cell culture techniques** and applications.

**UNIT – II**

Ribosomes, Golgi Complex, Lysosomes, Glyoxisomes, peroxisomes, centrioles and Mitochondria.

**UNIT – III**

**Chromosomes structure** –Heterochromosome, Euchromatin - **Giant chromosomes** (Polytene and Lamp brush chromosomes).

**UNIT – IV**

**Cancer biology** – structure of cancer cell, carcinogenesis. **Aging** – Cell death and apoptosis.

**UNIT – V**

Mechanism and enzymology of DNA replication, **Protein synthesis**.

**Reference Books:**

8. Cohn, N.S., 1979, Elements of Cytology, Freeman Book co., New Delhi.
9. De Robertis, E.D.P. and E.M.F. De Robertis, 1988. Cell and molecular Biology, 8th Edition, International edition Informes Hongkong. 734p.
10. Gies, A.C., 1979. Cell Physiology, Saunders co., Philadelphia, London, Toronto.
11. Powar, C.B., 1989. Essentials of Cytology, Himalaya Publishing House, Bombay.
12. Verma, P.S., and V.K. Agarwal, 1995. Cell and Molecular Biology, 8th Edition, S. Chand & Co., NewDelhi.
13. Rastogi. S.C. 2008 Cell and Molecular Biology, 2nd Edition, New Age International (p) Ltd., New Delhi.
14. Jayanthi .G.P. 2009 Molecular Biology, M.J.P Publ. Chennai.

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks

Time :3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.



II B.Sc (Zoo)	GENETICS	19ZO407
SEMESTER - IV		HRS/WK – 4
CORE - VII		CREDIT - 3

**Objective:**

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

**Course Outcome**

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

SEMESTER IV	COURSE CODE: 19ZO407					GENETICS										HOURS: 4	CREDITS: 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	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	

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

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

**UNIT – I**

**Introduction to genetics** – Basis of Mendelian Inheritance and Mendelian Laws – Interaction of Genes – Complementary Factors, Inhibitory and lethal Factors Atavism.

**UNIT-II**

**Multiple Alleles** – Blood Groups and their Inheritance in man. **Pedigree analysis** in human traits.

**UNIT – III**

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

**UNIT – IV**

**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**

**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.

**Reference Books:**

1. Verma, P.S. and V.K. Agarwal, 1995 Genectis, 8th edition, S. Chand & Co, New Delhi.
2. Gunther S. Stent 1986. Molecular Genetics. Macmillan Publishing Co Inc.
3. Higgins II, Best GJ and Jones J 1996 Biotechnology – Principles and application Black well scientific Publication Oxford London.
4. Gupta, P.K. 2001 Elements of Biotechnology Rastogi publication, Meerut.
5. Dubey, R.C 2006 Text Book of Biotechnology S. Chand & co. New Delhi.
6. Gardener. 1991. Principles of Genetics. 8th edition. John wiley & sons Inc. New York. Chichester, Brisbane, Toronto, Singapore.
7. Monroe. W. Strick Berger 2004 Genetics. Printice Hall of India New Delhi.
8. Kumar H. D. 1998 A text book of Biotechnology, affiliated East West pvt. Ltd., New Delhi.
9. Nicholls. 2002 Genetic Engineering, Cambridge University Press. UK.
10. S. Gladis Helen Hepsyba and CR. Hemalatha 2009 Basic Bioinformatics MJP Publ. Chennai.
11. Vijayaraman, Chellammal K.S and Manikkili. P 1998. Uyiriyae Thozhilnutpam. Chimeeraa, Trichy.

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks  
Time :3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

<b>II B.Sc (Zoo)</b>	<b>BIOTECHNOLOGY</b>	<b>19ZO408</b>
<b>SEMESTER - IV</b>		<b>HRS/WK – 4</b>
<b>CORE - VIII</b>		<b>CREDIT - 3</b>

**Objective:**

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

**Course Outcome**

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

SEMESTER IV	COURSE CODE: 19ZO408					BIOTECHNOLOGY										HOURS: 4	CREDITS :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	

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

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

**UNIT – I**

**Definition – Scope and applications** – isolation of DNA – cloning – Tools of Genetic Engineering – Enzymes, Linkers and Adaptors.

**UNIT-II**

Cloning vectors, [plasmids, pBr322, Phage I, Cosmids and phagemids]. Techniques of Genetic Engineering - recombinant DNA Technology.

**UNIT-III**

Gene Cloning in prokaryotes [**cDNA and Genomic Library**]. Basics of human genome project.

**UNIT – IV**

**Transgenic plants and animals** – DNA finger printing – gene therapy – biocensors – biochips – Production of Transgenic plant (Bt. Cotton) and transgenic animal (mice).

**UNIT-V**

**Application of Recombinant DNA technology** in Medicine & Agriculture – Socio economic issues of Biotechnology in India

**Reference Books:**

12. Verma, P.S. and V.K. Agarwal, 1995 Genectis, 8th edition, S. Chand & Co, New Delhi.
13. Gunther S. Stent 1986. Molecular Genetics. Macmillan Publishing Co Inc.
14. Higgins II, Best GJ and Jones J 1996 Biotechnology – Principles and application Black well scientific Publication Oxford London.
15. Gupta, P.K. 2001 Elements of Biotechnology Rastogi publication, Meerut.
16. Dubey, R.C 2006 Text Book of Biotechnology S. Chand & co. New Delhi.
17. Gardener. 1991. Principles of Genetics. 8th edition. John wiley & sons Inc. New York. Chichester, Brisbane, Toronto, Singapore.
18. Monroe. W. Strick Berger 2004 Genetics. Printice Hall of India New Delhi.
19. Kumar H. D. 1998 A text book of Biotechnology, affiliated East West pvt. Ltd., New Delhi.
20. Nicholls. 2002 Genetic Engineering, Cambridge University Press. UK.
21. S. Gladis Helen Hepsyba and CR. Hemalatha 2009 Basic Bioinformatics MJP Publ. Chennai.
22. Vijayaraman, Chellammal K.S and Manikkili. P 1998. Uyiriyae Thozhilnutpam. Chimeeraa, Trichy.

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks  
Time :3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

<b>II B.Sc (Zoo)</b>	<b>CORE PRACTICAL – II CELL AND MOLECULAR BIOLOGY, GENETICS AND BIOTECHNOLOGY</b>	<b>19ZOP42</b>
<b>SEMESTER - IV</b>		<b>HRS/WK - 3</b>
<b>CORE PRACTICAL – II</b>		<b>CREDIT - 5</b>

**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.

<b>III B.Sc (Zoo)</b>	<b>BIostatISTICS AND COMPUTATIONAL BIOLOGY</b>	<b>20ZO509</b>
<b>SEMESTER - V</b>		<b>HRS/WK - 5</b>
<b>CORE - V</b>		<b>CREDIT - 4</b>

**Objective:**

- To learn basics of Biostatistics and their application in biology
- To acquire knowledge on Computational Biology

**Course Outcome**

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

SEMESTER V	COURSE CODE: 20ZO509					BIostatISTICS AND COMPUTATIONAL BIOLOGY										HOURS: 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	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		

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

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



**BIOSTATISTICS****UNIT – I**

**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**

**Measures of central tendency:** mean, median and mode. Measures of Dispersion, Range, Quartile deviation, mean deviation & Standard deviation. Test of significance ( t- Test).

**COMPUTATIONAL BIOLOGY****UNIT – III**

**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**

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

**UNIT – V**

**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.

**Reference Books:**

1. Gupta SP 1996. Statistics –S. Chand and Co., New Delhi.
2. Jerold H. Zar 1984. Bio Statistical analysis [2nd edition] printice Hall of International edition.
3. Goutham Roy 2002. Introduction to Computing and computing lab and Cad Books and allied [pvt]ltd. Kolkata.
4. Christine Solomon. MS. OFFICE for Win – Microsoft office press. Developing Application with MS-OFFICE – Microsoft Office Press.
5. Cynthia Gibbs. Developing Bioinformatics Computer Skills. Sheoff Publishers & Distributors Pvt.Ltd., Mumbai.
6. Arthur. M. Lesk 2003. Introduction to Bioinformatics, Oxford University Press, New Delhi.
7. Arthur. M. Lesk, Introdution to protein Structures Oxford University Press, New Delhi, 2000
8. Baxevanis, A and Outllette 2005. Bioinformatics a practical guide to the analysis of genes and proteins, Willy – Interscience, Hoboken, NJ. USA.

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks  
Time: 3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

<b>III B.Sc (Zoo)</b>	<b>DEVELOPMENTAL BIOLOGY &amp; IMMUNOLOGY</b>	<b>20ZO510</b>
<b>SEMESTER - V</b>		<b>HRS/WK - 5</b>
<b>CORE - VI</b>		<b>CREDIT - 4</b>

**Objective:**

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

**Course Outcome**

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

SEMESTER V	COURSE CODE: 20ZO510					DEVELOPMENTAL BIOLOGY & IMMUNOLOGY										HOURS: 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	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		

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

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

**DEVELOPMENTAL BIOLOGY****UNIT – I**

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

**UNIT – II**

**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**

**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**

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**

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

**Reference Books:**

1. Balinsky, B.L., Introduction to embryology 1981. Saundeers, Philadelphia.
2. Berril & Corp Developmental Biology. McGraw Hill Book Company, MC., New York.
3. M.S. Jayaraj An Introduction to embryology Veer Bala Rastogi Publication.
4. Verma, P.S., V.K. Agarwal and Tyagi, 1995. Chordate embryology. S. Chand & co., New Delhi.
5. Majumdar, N.N. 1990. Text Book of Vertebrate embryology. Tata McGraw – hill Publishing company Ltd. New Delhi.
6. McEwen, R.S., 1969. Vertebrate Embryology. Oxford and IBH Publishing Co., New Delhi.
7. Jain, P.C 1998, Elements of Developmental Biology. Vishal Publication, New Delhi.
8. R.C. Dubey 2006 Text book of Biotechnology S. Chand and Co., New Delhi.
9. Roitt. I.M 2000 Essential Immunology, Blackwell Scientific Publishers.
10. Paul, W.E.M. 1989, Fundamental Immunology, Raven Press, New York.
11. Kuby. J. 1999, Immunology. W. H. Free man and Co. New York.
12. Current protocols in Immunology – 3 Volumes 1994 Wiley Publications.
13. Roitt. I, Brostoff, J. and Male. D. 2002. Immunology, Mosby, New York.
14. Richard, A. Golds, Thomas I, Kindt & Barbara A. Osborne 2000 Kuby Immunology, Freeman and Co. New York.
15. Madhavee Latha. P, 2012. Text book of Immunology, S. Chand & Company, New Delhi.

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks  
Time: 3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

III B.Sc (Zoo)	ANIMAL PHYSIOLOGY	20ZO511
SEMESTER - V		HRS/WK - 5
CORE - VII		CREDIT - 4

**Objective:**

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

**Course Outcome**

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

SEMESTER V	COURSE CODE: 20ZO511					ANIMAL PHYSIOLOGY										HOURS: 5	CREDITS: 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		

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

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

**UNIT – I****Nutrition and Digestion**

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

**UNIT – II****Respiration and Circulation**

Introduction – Respiratory Pigments and functions. Transport of gases [Co<sub>2</sub> and O<sub>2</sub>] – 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****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****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****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 langerhans, Testis and Ovary.

**Reference Books:**

1. Sambasivaiah, Kamalakara rao and Augustine chellappa 1990. A Text book of Animal physiology and ecology, S. Chand & co., Ltd., New Delhi – 110 055.
2. Parameswaran, Anantakrishnan and Ananta Subramanyam, 1975. Outlines of Animal Physiology, S. Viswanathan [ printers & Publishers ] Pvt. Ltd.
3. William S. Hoar, 1976. General and comparative physiology, prentice Hall of India Pvt. Ltd., New Delhi. 110 001.
4. Wood.D.W, 1983, Principles of Animal Physiology 3rd Ed.,
5. Prosser,C.L. and Brown, 1985, Comparative Animal Physiology, Satish Book Enterprise, Agra – 282 003.

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks

Time: 3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.



III B.Sc (Zoo)	<b>ELECTIVE-I APPLIED ENTOMOLOGY</b>	20EZ512A
SEMESTER - V		HRS/WK - 5
ELECTIVE-I (Compulsory)		CREDIT - 4

**Objective:**

- To provide extensive knowledge in the field of Entomology.
- 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 Outcome**

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

SEMESTER V	COURSE CODE: 20EZ512A					ELECTIVE-I APPLIED ENTOMOLOGY										HOURS: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	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	

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

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

**UNIT – I**

**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**

**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**

**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**

**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**

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

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

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks

Time: 3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

III B.Sc (Zoo)	ENVIRONMENTAL BIOLOGY	20ZO614
SEMESTER - VI		HRS/WK - 5
CORE - VIII		CREDIT - 4

**Objective:**

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

**Course Outcome**

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

SEMESTER VI	COURSE CODE: 20ZO614					ENVIRONMENTAL BIOLOGY										HOURS: 5	CREDITS: 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	

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

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

**UNIT – I**

**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**

**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**

**Biogeochemical cycles** – gaseous cycle [C,N<sub>2</sub> & 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**

**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**

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

**Reference 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, Kedar nath, Ram Nath Meerut – 250 001.
3. Clark, G.L. 1954, Elements of Eology, John wiley & Sons Inc., New York, London.
4. Ananthkrishnan, T.N, and S. Viswanathan, Principles of Animal Ecology.
5. Eugene P. Odum, 1971. Fundamentals of ecology, Saunders International Student Edition, W.B. Saunders Company, Philadelphia London, Toronto.
6. Verma, P.S and Agarwal 1986, Environmental Biology, S. Chand & Co Ltd. New Delhi.

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks

Time: 3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

III B.Sc (Zoo)	ECONOMIC ZOOLOGY	20ZO615
SEMESTER - VI		HRS/WK - 5
CORE - IX		CREDIT - 4

**Objective:**

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

**Course Outcome**

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

SEMESTER VI	COURSE CODE: 20ZO615					ECONOMIC ZOOLOGY										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	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	

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

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

**UNIT – I**

**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**

**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**

**Poultry**- Morphology of different breeds of Chicken – Brooding and Rearing of Chicks – Processing of Egg, Meat and By-Products of Poultry.

**UNIT – IV**

**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

**UNIT – V**

**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.

**Reference Books:**

1. Sukla, G.S. and Upadhyay, V.B., 2000 Economic Zoology – ISBN – 81- 7133 -137 -8 Rastogi Publication, Meerut, India
2. Jawaid Ahsan and Subhas Prasad sinha – 2000 A Handbook on Economic Zoolgy - Chand & co., Ltd., New Delhi.
3. Ashok Kumar and Prem Mohan Nigam, 1991 Economic and Applied Entomology Emkay Publication, New Delhi.
4. Shammi,Q.J. and Bhatnagar, S., 2002 Applied Fisheries Agrobios [India],Jodhpur - India
5. Major Hall, C.B. 2005 Ponds and Fish culture.
6. Agrobios [India], Jodhpur - India
7. Keith Wilson, N.D.P., 2005 A Handbook of Poultry Practice
8. Agrobios [India], Jodhpur - India
9. Banerjee, G. C. 1992 Poultry – III – Edition
10. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
11. Banerjee, 1988
12. A Text book of Animal Husbandry – VIII- Edition xford & IBH Publishing co. Pvt. Ltd., New Delhi.
13. Kaushish, S.K., 2001 Trends in livestock Research
14. Agrobios [India], Jodhpur - India
15. Ismail, S.A1997. Vermicology the Biology of Earth worm orient Longman, India.
16. Mary Violet chrishty .A 2008 Vermi technology MJP Publ. Chennai.



**QUESTION PATTERN**

Written paper Max Marks: 75 Marks  
Time: 3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

III B.Sc (Zoo)	EVOLUTION	20ZO616
SEMESTER - VI		HRS/WK - 5
CORE - X		CREDIT - 4

**Objective:**

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

**Course Outcome**

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

SEMESTER VI	COURSE CODE: 20ZO616					EVOLUTION										HOURS: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	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	

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

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

**UNIT – I**

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

**UNIT – II**

**Theories:** Lamarckism, Neolamarckism, Darwinism, NeoDarwinism, Devries concept of Mutation. Modern version of Mutation theory.

**UNIT – III**

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

**UNIT-IV**

**Mimicry** – Batesian and mullerian mimicry and evolution, living fossils. Distribution of animals.

**UNIT – V**

**Isolation** – Premating and post mating isolating mechanism, speciation. **Evolution of man** – Biological and cultural.

**Reference Books:**

1. Agarwal, V.K and Usha Gupta –1990. Evolution and animal distribution, Chand and Co.,
2. Dodson, E.O.. Evolution, Reinhold, Newyork.
3. Francisco, J.Ayla – Evolution, Surject publication.
4. Gopalakrishnan, T.S. Itta Sambasivaiah and A.P.Kamalakara Rao. Principles of organic Evolution, Himalaya publishing house.
5. Ranganathan T.K., Evolution. 1994 Rainbow Printers, Palayankottai.
6. Veer Bala Rastogi. Organic Evolution, Meerut Publications.
7. Arumugam, N. Organic Evolution, 2009 Saras. Publ. Nagarcoil.

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks  
Time: 3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

III B.Sc (Zoo)	<b>ELECTIVE-II AQUACULTURE</b>	20EZ617A
SEMESTER - VI		HRS/WK - 5
ELECTIVE-II (Compulsory)		CREDIT - 4

**Objective:**

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

**Course Outcome**

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

SEMESTER VI	COURSE CODE: 20EZ617A					ELECTIVE-III AQUACULTURE										HOURS: 5	CREDITS: 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	

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

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

**UNIT I**

Definition of aquaculture – Principles of site selection for fish farms, water, soil, types and other parameters.

**UNIT II**

Types of aquaculture - Monoculture, Poly culture, Integrated farming, Pond culture, Pen and Cage culture, Raft culture, Race way culture, Warm and cold water fish culture .

**UNIT III**

Criteria for selection of variety – Seed procurement and stocking management. Water quality management.

**UNITIV**

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

**UNIT V**

Mari culture – Culture of edible oyster, pearl oyster, mussels, clams, sea urchins, sea cucumbers

**REFERENCES:**

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. Smitherman and G. Tehebenoglous (Eds), 1983, Oregon State University, U.S.A.
3. Home Aquarium: aquatic gema and tropical fish, 1970, Makinos Japan Publications

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks  
Time: 3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

III B.Sc (Zoo)	Skill Based Subject SERICULTURE	20EZ618B
SEMESTER - VI		HRS/WK - 5
Skill Based Subject		CREDIT - 3

**Objective:**

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

**Course Outcome**

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

SEMESTER VI	COURSE CODE: 20EZ618B					Skill Based Subject SERICULTURE										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	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	

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

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



**UNIT – I**

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

**UNIT – II**

**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**

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

**UNIT – IV**

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

**UNIT – V**

**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.

**Reference Books:**

1. Ganga, G. 2003: comprehensive sericulture Vol-I, Moriculture – Oxford –IBH Publ. Co. India.
2. Ganga, G. 2003: comprehensive sericulture Vol –II Silkworm rearing – Oxford – IBH Publ. Co. India.
3. Ganga, G. and Sculochana Chetty, J. 1997: An Introduction to sericulture Oxford – IBH Publ. Co. India.

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks  
Time: 3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

<b>III B.Sc (Zoo)</b>	<b>CORE PRACTICAL – III BIostatistics, ANIMAL PHYSIOLOGY, DEVELOPMENTAL BIOLOGY AND IMMUNOLOGY</b>	<b>20ZOP63</b>
<b>SEMESTER - VI</b>		<b>HRS/WK - 3</b>
<b>CORE PRACTICAL - III</b>		<b>CREDIT - 5</b>

**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 (Zoo)	<b>CORE PRACTICAL - IV ENVIRONMENTAL BIOLOGY, ECONOMIC ZOOLOGY AND EVOLUTION</b>	20ZOP64
SEMESTER - VI		HRS/WK - 3
<b>CORE PRACTICAL - IV</b>		<b>CREDIT - 5</b>

**Estimation** of Dissolved oxygen, salinity, pH, Free CO<sub>2</sub>, 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 – Redsoil with calciferous gland.

Pheretima posthuma – North Indian – Large specimen.

Eudrilus eugenia – Redworm, Exotic.

Fish parasites [Lernea, Argulus].

#### **Larvivorous fishes :**

Poecelia 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.

**DEPARTMENT OF ZOOLOGY****ALLIED ZOOLOGY  
&  
ENVIRONMENTAL STUDIES (SKILL- BASED)****COURSE PATTERN**

<b>SEMESTER</b>	<b>PART</b>	<b>CODE</b>	<b>SUBJECT TITLE</b>	<b>HOURS</b>	<b>CREDITS</b>
III	III	AZCMB301	Classical Genetics & Biostatistics / Laboratory animal care (II Year MicroBiology)	5	4
III	III		<b>Practical-</b> Classical Genetics & Biostatistics / Laboratory animal care (II Year MicroBiology)	3	2
IV	III	AZMB402	Applied Entomology/Solid waste Management (II Year MicroBiology)	5	4
IV	III		<b>Practical -</b> Applied Entomology/Solid waste Management (II Year MicroBiology)	3	2
IV	III		Allied Zoology-Theory (II Year Bio –Chemistry)	5	4
IV	III		Allied Zoology-Practical (II Year Bio –Chemistry)	3	2
III & IV	IV	EVS301S & EVS401S	Environmental Studies(All UG B.Sc/B.A/B.COM/B.C.A)	3	3

II B.Sc (MB)	CLASSICAL GENETICS & BIO-STATISTICS	AZCMB301
SEMESTER - III		HRS/WK – 5
ALLIED		CREDIT – 4

(For II Year B.Sc., Micro-Biology )

**Objective:**

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

**Course Outcome**

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

SEMESTER III	COURSE CODE:					CLASSICAL GENETICS & BIO-STATISTICS										HOURS: 5	CREDITS: 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	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	

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

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

**Unit – I : 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 : 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: Molecular, Human and 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:**

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:**

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. Biostatistics P. Ramakrishnan Saras Publications 1996 A.R.P. Camp Road, Kottar, Nagarkoil, Kanyakumari District.
3. Elements of Biostatistics by Gurumani 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.

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks

Time :3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers(50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.



<b>II B.Sc (MB)</b>	<b>CLASSICAL GENETICS &amp; BIO-STATISTICS PRACTICALS</b>	
<b>SEMESTER - III</b>		<b>HRS/WK – 3</b>
<b>ALLIED PRACTICALS</b>		<b>CREDIT – 2</b>

**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 (MB)	SOLID WASTE MANAGEMENT	AZMB402
SEMESTER - IV		HRS/WK – 8
ALLIED		CREDIT – 6

(For II Year B.Sc., Micro-Biology)

**Objective:**

- To provide basic knowledge solid waste management and their handling rules as well as vermicomposting technology

**Course Outcome**

On completion of the course students will be able

**CO1:** To describe the types, sources and generation of solid waste and their handling rules

**CO2:** To identify the types of industrial waste and their treatment and disposal methods

**CO3:** To describe biomedical waste and hazardous waste and their handling rules

**CO4:** To understand various species of earthworm, vermiculture and vermicomposting

**CO5:** To gain information regarding composting technology and economics of vermicomposting

SEMESTER IV	COURSE CODE:					SOLID WASTE MANAGEMENT										HOURS: 8	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	3	4	1	1	3	3	2	5	5	5	3.7	
CO2	5	5	5	5	4	3	4	1	1	3	3	2	5	5	5	3.7	
CO3	5	5	5	4	4	3	4	1	1	3	3	2	5	5	5	3.7	
CO4	5	5	4	4	4	3	4	1	1	4	5	2	5	5	5	3.8	
CO5	5	5	4	4	4	3	4	1	1	4	5	2	5	5	5	3.8	
Mean Overall Score															3.7		

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

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

**Unit I : Introduction (20 Hrs)**

Waste – classification, quantification, solid waste management and disposal, source and generation of solid wastes – characterization, composition and classification, physico-chemical properties - Municipal solid wastes: Collection, storage and transportation – disposal methods – sanitary land fills, shredding and pulverizing, baling, incineration, composting, vermicomposting, recycling – energy recovery from wastes – municipal wastes management and handling rules (1999)

**Unit II: Industrial wastes: (20 Hrs)**

Industrial solid wastes and description – health hazards – collection and storage – treatment and disposal - liquid wastes – primary, secondary and tertiary treatments – water pollution and their effects on animals and plants – water quality standards – gaseous pollution – types and sources – air pollution control.

**Unit III: Bio-medical wastes: (20 Hrs)**

Generation – legal aspects and environmental concern – Bio-medical waste management and handling rules, 1998 – storage, handling and transportation of bio-medical wastes – disposal technologies - Hazardous wastes: Definition – characteristics – sources and transportation – radioactive wastes – half life, mode of decay, effect on plants, animals and man – treatment methods; physical, chemical and biological methods – site remediation – waste minimization – hazardous waste rules, 1989.

**Unit IV : Earthworms: (20 Hrs)**

Characteristics, types – Indian species – suitable species for vermicomposting – digestion, decomposition and humification – role of microorganisms - Earthworm culture: Steps involved in the culture of indigenous and exotic species of earthworms – physical, chemical and biological requirements – protection of worms from predators – enemies of earthworms - Organic wastes: Definition – types and sources of various organic wastes – utilization of organic wastes in vermiculture and vermicomposting.

**Unit V: Composting technology: (20 Hrs)**

Definition – types of vermicomposting – requirements – advantages – precautionary measures - nutrients enhancement of vermicompost – effect of vermicomposting in the soil fertility - Economics of vermicomposting: Small scale and large scale applications of vermicomposting – loan facilities – marketing strategies.

**Field Work: (20 Hrs)**

Methods of vermicomposting – preparation of vermi bed – monitoring – bio-manure production – application of compost for culture operations – minor project reports.

**Text Books:**

Study materials given

**Reference Books:**

1. K.C.Agarwal, 2001. Environmental pollution: Causes, Effects and Control, Nidhi Publisher (India), Bikaner.
2. Verma, P.S., and VK. Agarwal. 2003. Environmental Biology, S. Chand and Company. Ram Nagar, New Delhi.

3. Pradyot Patnik, 1977. Hand book of Environmental Analysis. Chemical Pollutants in Air, Water, Soil and Solid wastes, Lewis Publishers, CRC Press. U.S.A.
4. S.A. Abbasi, 1998. Water Quality, Sampling and Analysis. Discovery Publishing House, New Delhi.
5. P.K. Gupta, 2000. Methods in Environmental Analysis. Water Soil and Air, Agrobios (India) Jodhpur.
6. Bhatnager and R.K. Patra (1996); Earthworm, Vermiculture and Vermicompositing, Kalyani Publishers, New Delhi.
7. C.A. Edwards and B.J. Bohlen (1996); Biology and Ecology of Earthworms, Chapman and Hall, London.
8. S. Ismail (1997); Vermicology, Orient Long man Limited, Chennai.
9. K.E. Lee (1985) 'Earthworms; Their Ecology and Relationship with Soils and Land Use', Academic Press, Sydney.
10. J.E. Satchell (Ed) (1983) - Earthworm Ecology: From Darwin to vermi culture. Chapman and Hall, "London.

### QUESTION PATTERN

Written paper Max Marks: 75 Marks

Time :3 Hours

A Question paper consists of three parts

#### **Part-A**

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

#### **Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

#### **Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

#### **Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

#### **Part-B**

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

#### **Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

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

**Objective:**

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

**Course Outcome**

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

SEMESTER IV	COURSE CODE:					ALLIED APPLIED ENTOMOLOGY										HOURS: 5	CREDITS: 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	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	

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

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

**UNIT – I****Introduction to Entomology**

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

**UNIT – II****Agricultural entomology**

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

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

**UNIT – III****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****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**

**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.

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

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks

Time: 3 Hours

A Question paper consists of three parts

**Part-A**

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

**Part-B**

5 questions are to be answered out of 8 given .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions, containing internal choice to be answered in about 1200 words. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

II B.Sc (MB)	<b>ALLIED APPLIED ENTOMOLOGY-PRACTICAL</b>	<b>AZBCP401S</b>
<b>SEMESTER - IV</b>		<b>HRS/WK – 3</b>
<b>ALLIED</b>		<b>CREDIT -</b>

**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 (BC)	<b>ALLIED ZOOLOGY</b> For the students admitted in the year 2019	AZBC401T
SEMESTER - IV		HRS/WK – 5
ALLIED		CREDIT - 3

**Objective:**

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

**Course Outcome**

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

SEMESTER IV	COURSE CODE:					ALLIED ZOOLOGY										HOURS: 5	CREDITS :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	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	

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

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

**Unit: 1**

**INVERTEBRATES** - Structural and functional details of phylum-Protozoa-*Plasmodium vivax*, Helminthes-*Taenia solium*, Annelida-Earthworm- Digestive system,

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

**Unit: 3**

**CYTOLOGICAL TECHNIQUES AND HUMAN GENETICS** – Histological techniques – Fixation- selective fixatives- Embedding- Sectioning and Staining Principles. Mendels experiments, Fine structure of Gene, 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**

**DEVELOPMENTAL BIOLOGY**- Gametogenesis in mammals – Spermatogenesis, Oogenesis, Fertilization. Types of Eggs, Pattern of cleavage & Blastulataion in chick, Gastrulation. Human Reproduction- puberty, Menstrual cycle, Menopause, Pregnancy and related problems-parturition and lactation- Human cloning- Ethics.

**Unit: 5**

**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. Ekambaranatha Ayyar & T.N.Ananthkrishnan (1992) Manual of Zoology Vol – I, part I & II S.Viswanathan Pvt. Ltd. Chennai.
2. Jordan.E.L & P.S.Verma (2000) ‘Chordate Zoology’ S.Chand & Co New Delhi.

**ANIMAL PHYSIOLOGY:**

1. Parameswaran.R.S.Viswanathan – Animal Physiology Printers & Publishers Pvt. Ltd.
2. Verma.P.S and Agarwal.V.K. Animal Physiology S.Chand & Co NewDelhi.

**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, Jaiprakash Nath and Company., Meerut.
3. Max Levitan Tex Book of Human Genetics - Oxford University Press.

**DEVELOPMENTAL BIOLOGY**

1. Verma.S and Agarwal V.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.Verma V.K.Agarwal S.Chand & Co. New Delhi.
2. Odum E.P.Basic Ecology (1983) Saunders College Publishing's New York.
3. Arumugam.N (2002) Organic Evolution, Saras Publication., Nagercoil.

**QUESTION PATTERN**

Written paper Max Marks: 75 Marks  
Time :3 Hours

A Question paper consists of three parts

**Part-A**

10 very short answer question without choice .Equal representation to be given to both the papers. Each question is to be answered in about 50 words . Each answer is to be valued out of 2 marks.

**Part-B**

5 questions are to be answered out of 8 given . Equal representation to be given to both the papers. Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

**Part-C**

Essay questions containing internal choice to be answered in about 1200 words. Equal representation to be given to both the papers. Each answer is to be valued out of 15 marks.

**Part-A**

Very Short Answers (50 words) 10 questions each 2 marks.

**Part-B**

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

**Part-C**

Essay questions (1200 words) 2 questions each 15 marks.

II B.Sc (BC)	ALLIED ZOOLOGY- PRACTICAL	
SEMESTER - IV		HRS/WK – 3
ALLIED		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, *Taenia solium*, Placoid scale, T.S. of Pituitary gland, Adrenal gland, Thyroid gland, Testis and Ovary.

<b>II YEAR</b>	<b>ENVIRONMENTAL STUDIES</b>	<b>EVS301 S/ EVS401S</b>
<b>SEMESTER – III</b>		<b>HRS/WK - 3</b>
<b>NME</b>		<b>CREDIT - 2</b>

(For All UG II Year Students Any One Semester)

**Objective:**

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

**Course Outcome:**

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.

SEMESTER III	COURSE CODE:					ENVIRONMENTAL STUDIES										HOURS: 3	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	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		

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

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

**Unit I : Environmental studies and Natural resources (20 Hrs)**

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: Ecosystems : (20 Hrs)**

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: (20 Hrs)**

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: (20 Hrs)**

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: (20 Hrs)**

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: (20 Hrs)**

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](mailto: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

### **QUESTION PATTERN**

Written paper Max Marks: 75 Marks  
Time :3 Hours

A Question paper consists of three parts

#### **Part-A**

20 choose the answer question. Equal representation to be given to both the papers. Each answer is to be valued out of 1 marks.

#### **Part-B**

5 questions are to be answered out of 8 given. Equal representation to be given to both the papers .Each question is to be answered in about 300 words . Each answer is to be valued out of 5 marks.

#### **Part-C**

Essay questions containing internal choice to be answered in about 1200 words. Equal representation to be given to both the papers. Each answer is to be valued out of 15 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 (1200 words) 3 questions each 10 marks.

Field work

### சுற்றுச் சூழல் அறிவியல்

#### Unit/அலகு-1 சுற்றுச் சூழியியல் 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.