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

CUDDALORE-1

DEPARTMENT OF ZOOLOGY

SYLLABUS 2018-2019

ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)
CUDDALORE-1
B.Sc. ZOOLOGY DEGREE COURSE

CURRICULUM DESIGN TEMPLATE (TENTATIVE)
B. Sc. Zoology – Course of study and Scheme of Examinations

(With effect from 2018 - 2019)

SEME -STER	COURSE	COURSE TITLE	HOURS	CREDITS	EXAM HOURS	MARKS
I	**Language – I**	Tamil/French/Hindi-I	4	3	3	100
	English – I	Functional English-I	4	3	3	100
	Core – I	Invertebrata	8	5	3	100
	Allied - I (Compulsory)	Chemistry - I	5	3	3	100
	Skill Based Subject	**Value Education**	3	2		100
	Core practical- I	**Practical-I** Invertebrata and Chordata	3			
	Allied Chemistry	**Practical – I**	3	2	3	100
	Total for Semester I		**30**	**18**		
II	**Language – II**	Tamil/French/Hindi-II	4	3	3	100
	English – II	Functional English-II	4	3	3	100
	Core – II	Chordata	8	4	3	100
	Allied – II (Compulsory)	Analytical Chemistry –II	5	3	3	100
	Skill Based Subject	**Personality Development**	3	2	3	100
	Core Practical – I	**Practical – I** Invertebrata and Chordata **(Contd.)**	3	5	3	100
	Allied Chemistry	**Practical – II**	3	2	3	100
	Total for Semester II		**30**	**22**		
III	**Language – III**	Tamil/French/Hindi-III	4	3	3	100
	English – III	Functional English-III	4	3	3	100
	Core – III	Cell and Molecular Biology	8	4	3	100
	Allied - III (Compulsory)	Botany I	5	4	3	100

	Ability Enhancement course	**Environmental Science**	3	2	3	100
	Core Practical – II	**Practical – II** Cell and Molecular biology, Genetics and Biotechnology	3	-	3	
	Allied Practical – III	**Botany Practical**	3		3	
	Total for Semester III		**30**	**16**		
IV	**Language – IV**	Tamil/French/Hindi-IV	4	3	3	100
	English – IV	Functional English-IV	4	3	3	100
	Core – IV	Genetics and Biotechnology	8	4	3	100
	Allied – IV (Compulsory)	Botany II	5	4	3	100
	Skill Based Subject (Optional)	**1** **Bio fertilizer Production** **2** Apiculture	3	2	3	100
	Core Practical – II	**Practical – II** Cell and Molecular biology, Genetics and Biotechnology **(Contd.)**	3	5	3	100
	Allied Practical – III	**Botany Practical**	3	2	3	100
	Total for Semester IV		**30**	**23**		
V	**Core – V**	Biostatistics and Computational Biology	5	5	3	100
	Core – VI	Developmental Biology and Immunology	5	5	3	100
	Core – VII	Animal Physiology	5	5	3	100
	Elective – I (Compulsory)	**Applied Entomology**	5	5	3	100
	Elective-II A	**Biophysics**	4	4	3	

	(Optional)	**B**	Biochemistry				100
	Core Practical – III		**Practical – III** Animal Physiology, Developmental Biology and Immunology	3	-		
	Core Practical – IV		**Practical – IV** Environmental Biology and Economic Zoology	3	-		100
	Total for Semester V			**30**	**24**	**3**	
VI	**Core – VIII**		Environmental Biology	5	5	3	100
	Core – IX		Economic Zoology	5	5	3	100
	Core – X		Evolution	5	5	3	100
	Elective –III (Compulsory)		**Aquaculture**	5	5	3	100
	Skill based subject(optional)		**A)Sericulture** B)Public Health and Hygiene	4	4	3	100
	Core Practical – III		**Practical – III** Animal Physiology and Developmental Biology and Immunology **(Contd.)**	3	5	3	100
	Core Practical – IV		**Practical – IV** Environmental Biology and Economic Zoology **(Contd.)**	3	5	3	100
	Extension Activities				3		
	Total for Semester VI			**30**	**37**		

COURSE OUTCOME

I B.Sc (Zoo)	INVERTEBRATA	18ZO101
SEMESTER - I		HRS/WK - 8
CORE - I		CREDIT - 4

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 the phylum protozoa

CO2: To identify the phylum Porifera and Coelenterate with taxonomic keys

CO3: To classify the phylum Helminthes and Annelida upto classes with examples

CO4: To classify the phylum Arthropoda upto classes with examples

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

SEMESTER I	COURSE CODE: 18ZO101					COURSE TITLE: INVERTEBRATA									HOURS: 8	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	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. **PROTOZOA**: General characters and classification upto classes with examples. **Type study- paramecium,** parasitic protozoans [Entamoeba, Trypanosoma and plasmodium]

UNIT – II

PORIFERA: General characters and classification upto classes with examples. **Type study - sycon,** spicules and canal system in sponges. **COELENTERATA:** General characters and classification upto classes with examples. **Type study** – **Obelia,** polymorphism in coelenterates – corals and coral reefs.

UNIT – III

HELMINTHES: General characters and classification upto classes with examples. **Type study** – ***Taenia solium*.** helminthes parasites (Wuchereria bancrofti, Ascaris and Faciola). **ANNELIDA**: General characters and classification upto classes with examples. **Type study**: **Earthworm,** metamerism in Annelids, parasitic adaptations of Leech.

UNIT – IV

ARTHROPODA: General characters and classification upto classes with examples. **Type study** – **Prawn,** Peripatus and its affinities, Mouth parts of insects. Crustacean larvae and their importance.

UNIT – V

MOLLUSCA: General characters and classification upto classes with examples. **Type study** – **Fresh water Mussel,** Economic importance of mollusca, torsion in mollusca. **ECHINODERMATA**: General characters and classification upto classes with examples. **Type Study- Star fish,** Echinoderm larvae and their significance.

Reference Books:

Ekambaranatha Ayyar.M. and T.N. Ananthakrishnan, 1992. Manual of Zoology Vol.1 [Invertebrata], Viswanathan [Printers and Publishers] Pvt. Ltd.; Madras.

Jordan, E.L. and P.S.Verma, 1993. Invertebrate Zoology, 12th Edition. S.Chand and Co.Ltd., NewDelhi.

Kotpal, R.L. 1988-1992 Protozoa, Porifera, Coelenterata, Helminthes, Annelida, Arthropoda,Mollusca, Echinodermata. Rastogi Publications, Meerut.

Parker and Haswell, 1964 Test Book of Zoology. Vol.1 [Invertebrata]. A.Z.T; B.S.Publishers and distributors, New Delhi.

L.A Borradile and F.A.Pott, 1972 The Invertebrates. Cambridge University Press. UK.

Adam Sedgwick. A student text book of Zoology. Vol.I and II. Central book Depot. Allahabad.

P.S.Dhami and J.K.Dhami. 1969 Invertebrate Zoology, S.Chand and Co. New Delhi.

Hyman L.H. The Invertebrate Vol.I-IV. 1955, McGraw Hill Co. New York.

Barrington, E.J.W.. Invertebrate structure and function. ELBS Publication.

Barnes. Invertebrate Zoology. Toppan International Co.

I B.Sc (Zoo)	CHORDATA	18ZO201
SEMESTER - II		HRS/WK – 8
CORE - II		CREDIT – 4

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 prochordata

CO2: To know classification of phylum Pisces and Amphibians

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: 18ZO201					COURSE TITLE: CHORDATA									HOURS: 8	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	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	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.- Sub phylum: Prochordata: **Type study**: **Amphioxus** (Cephalochordata) - General Characters and affinities of - **Balanoglossus** (Hemichordata) & **Ascidian** (Urochordata).

UNIT –II

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

UNIT – III

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

UNIT – IV

Class AVES - General characters and classification upto orders. **Type study** –**Pigeon.** Features of Archaeopteryx, Ratitae, Migration in birds, Flight adaptation.

UNIT – V

MAMMALIA - General characters and classification upto orders. **Type study** – **Rabbit.** Egg laying mammals. Dentition in mammals. Aquatic mammals.

Reference Books:

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

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

DISSECTIONS

Earthworm – Digestive system

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

MINOR PARCTICAL

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, Fasiola, 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:

Verma. P.S. 2011 A Manual of Practical Zoology INVERTEBRATES Chand & Co, Ltd, Ram Nagar -New Delhi.

Verma. P.S. 2011 A Manual of Practical Zoology CHORDATES, Chand & co, Ltd. Ram Nagar – New Delhi.

Jayanpa Sinha . 2010 Advanced Practical Zoology, Books & Allied (p) Ltd. No.1. Subham Plaza IFloor, Calcutta.

II B.Sc (Zoo)	CELL AND MOLECULAR BIOLOGY	
SEMESTER - III		HRS/WK – 8
CORE - III		CREDIT – 4

Objective:

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

Course Outcome

On completion of the course students will be able

CO1: To understand the cytological techniques, biochemical and cell culture techniques

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

CO3: To recognize the properties of cytoplasm and ultra-structure of nucleus and types of chromosomes.

CO4: To explain cell cycle, cell division and cancer biology

CO5: To obtain knowledge on structure and functions of DNA and RNA and protein synthesis

SEMESTER III	COURSE CODE:					COURSE TITLE: CELL AND MOLECULAR BIOLOGY									HOURS: 8	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	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 and Molecular Biology – Principles of microscope light and electron, **Cytological techniques** - cell fractionation, Homogenization Centrifugation, Isolation of Sub-cellular components. **Biochemical techniques** – Electrophoresis and their applications. **Cell culture techniques** and applications.

UNIT – II

Cell – Cell theory, Ultra structure of animal cell – structure, composition and functions – cell components – Plasma Membrane – Endoplasmic reticulum, Ribosomes, Golgi Complex, Lysomes, Glyoxisomes, peroxisomes, centrioles and Mitochondria.

UNIT – III

Cytoplasm – Physical, chemical and biological properties. **Nucleus** – Ultrastructure, Composition and Function – **Chromosome structure** –Heterochromosome, Euchromatin - **Giant chromosomes** (Polytene and Lamp brush chromosomes).

UNIT – IV

Cell cycle and cell division – Amitosis, Mitosis and meiosis and their significance. **Cancer biology** – structure of cancer cell, carcinogenesis. **Aging** – Cell death and apoptosis.

UNIT – V

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

Reference Books:

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

II B.Sc (Zoo)	BOTANY- I	
SEMESTER - III		HRS/WK – 5
ALLIED-III		CREDIT – 4

Objective:

- To teach of basic idea of plant science through traditional disciplines such as plant anatomy, morphology, life history and economic importance of some plants species.

Course Outcome

On completion of the course students will be able

CO1: To understand the cell organelles in plants

CO2: To describe anatomy of plant cells.

CO3: To get knowledge on bacteria and viruses

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

CO5: To acquire knowledge on Structure, life history and economic importance of Chlorella, Penicillium and Agaricus

SEMESTER I & IV	COURSE CODE:					COURSE TITLE: BOTANY-I										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	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: Cell Biology
Prokaryotic and Eukaryotic cell (plant cell)
Cell organells - Chloroplast, Mitochondrion and Nucleus.
Cell division – Mitosis.

UNIT-II: Anatomy
Tissues - Meristematic and permanent tissues. Primary and Normal Secondary thickening of Dicot stem.

UNIT-III: Bacteria and Viruses
Bacteria - General characters - shape - flagellation - Structure of E. Coil - reproduction - (Vegetative and asexual), Economic importance. Structure of Tobaco Mosaic Virus, Bacteriophage.

UNIT-IV: Structure and Life History of
a) Chlorella and Gracilaria
b) Albugo, Penicilium and Agaricus

UNIT-V: Structure and Life History of
a) Funaria
b) Lycopodium
c) Cycas
Economic importance of Chlorella, Penicillium and Agaricus.

Text Books

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

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

Reference Books

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

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

II B.Sc (Zoo)	GENETICS AND BIOTECHNOLOGY	
SEMESTER – IV		HRS/WK – 8
CORE – IV		CREDIT – 4

Objective:

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

Course Outcome

On completion of the course students will be able

CO1: To acquire basic information Mendelian laws, multiple alleles and pedigree analysis

CO2: To understand linkage and crossing over and fine structure of gene

CO3: To acquire knowledge on mutation and population genetics

CO4: To understand the scope and applications of biotechnology

CO5: To describe the transgenic plants and animals and application of rDNA technology

SEMESTER IV	COURSE CODE:					COURSE TITLE: GENETICS AND BIOTECHNOLOGY									HOURS: 8	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	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

GENETICS

UNIT – I

Introduction to genetics – Basis of Mendelian Inheritance and Mendelian Laws – Interaction of Genes – Complementary Factors, Inhibitory and lethal Factors Atavism. **Multiple Alleles** – Blood Groups and their Inheritance in man. **Pedigree analysis** in human traits.

UNIT – II

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

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.

BIOTECHNOLOGY

UNIT – IV

Definition – Scope and applications – isolation of DNA – cloning – Tools of Genetic Engineering – Enzymes, Linkers and Adaptors, Cloning vectors, [plasmids, pBr322, Phage I, Cosmids and phagemids]. Techniques of Genetic Engineering - recombinant DNA Technology and gene Cloning in prokaryotes **[cDNA and Genomic Library].** Basics of human genome project.

UNIT – V

Transgeneic plants and animals – DNA finger printing – gene therapy – biocensors – biochips – Production of Transgenic plant (Bt. Cotton) and transgenic animal (mice) - **Application of Recombinant DNA technology** in Medicine & Agriculture – Socio economic issues of Biotechnology in India

Reference Books:

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

II B.Sc (Zoo)	**BOTANY- II**	
SEMESTER – IV		**HRS/WK – 5**
ALLIED-IV		**CREDIT – 4**

Objective:

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

Course Outcome

On completion of the course students will be able

CO1: To understand the taxonomy of plants

CO2: To describe embryology of plants.

CO3: To understand plant physiology and tissue culture

CO4: To describe fresh water ecosystem and pollution

CO5: To acquire knowledge on plant genetics and evolution

SEMESTER I & IV	COURSE CODE:					COURSE TITLE: BOTANY-II										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	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. Study of the range of characters and economic importance of the following families: Annonaceae, cucurbitaceae, Apocynaceae, Euphorbiaceae and Liliaceae.

UNIT-II: Embryology
Structure of mature anther. Structure of mature ovule and its types. Fertilization.

UNIT-III: Plant Physiology & Plant Tissue Culture
Physiological role of micro and macro elements their deficiency symptoms Photosynthesis - lightreaction - Calvin cycle Respiration - Glycolysis - Kreb's cycle - electron transport system. Growth hormones – Auxins. Tissue culture and its principles.

UNIT-IV: Ecology
Ecosystem - fresh water ecosystem. Environmental pollution. Major pollutants - types of pollution - Air pollution, water pollution, soil pollution - control measures.

UNIT-V: Genetics & Evolution
Mendelism - Monohybrid and dihybrid crosses. Theories of evolution - Lamarckism, Darwinism.

Text Books

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

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

Reference Books

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

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

II B.Sc Zoology	APICULTURE	19EZ402
SEMESTER – IV		HRS/WK – 3
Skill Based Course (Optional)		CREDIT – 2

Objective:

- Entrepreneur motivation for practicing Apiculture as cottage Industry.

COURSE OUTCOME

On completion of the course students will be able

CO1: To understand the classification of honey bee

CO2: To gain knowledge on method of bee keeping and extraction of honey

CO3: To understand the diseases and control measure of honey bee

CO4: To get knowledge on products of bee keeping

CO5: To describe bee keeping industry

Relationship Matrix Course Outcomes, Programme Outcomes and Programme Specific Outcomes

SEMESTER VI	COURSE CODE: 19EZ402					COURSE TITLE: Skill Based Subject APICULTURE									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	4	5	4	4	4	3	1	2	3	1	5	2	5	3.5
CO2	5	5	4	5	4	4	4	5	3	2	3	1	5	2	5	3.8
CO3	5	5	5	5	4	4	4	4	2	2	3	1	5	2	5	3.7
CO4	5	5	5	5	4	4	4	3	2	2	3	1	5	2	5	3.7
CO5	5	5	5	5	4	4	4	3	1	2	3	1	5	2	5	3.6
Mean Overall Score																3.7

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

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

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

UNIT-I **9Hours**

History – Biology and classification of honey bee, species of honey bees, Social organization of honey bee colony.

UNIT-II **9Hours**

Bee hive – Flora for apiculture – Selection of bees for apiculture, Method of bee Keeping – Indigenous method of Extraction of honey.

UNIT-III **9Hours**

Modern method of apiculture – Appliances for modern method, Diseases of Honey bee and control measures.

UNIT-IV **9Hours**

Products of bee keeping : Honey – Bee wax and Bee Yeman – Honey :Production, Chemical composition – Economic importance of Honey bee wax.

UNIT-V **9Hours**

Bee enemies – Bee keeping industry – Recent efforts – Modern method in employing honey bees for cross pollination in horticultural gardens.

Text Books:

1. Sardar Singh, Bee keeping in India
2. Sharma .P.L., & Singh S. Hand Book of Bee keeping.

References Books:

1. M.S. Nalina Sundari 2006,Entomology M.J.P publications , Chennai.
2. Honey – A comprehensive survey – International Bee Research Association for house – CNRC (England)
3. Roger. A. Morse, 1990. The ABC & XYZ of Bee culture, 40th ed., A.I Root & Co., Medina, ohio 44256. 516 pp.

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

CELL AND MOLECULAR BIOLOGY

Cytometry

Compound microscope, Camera Lucida, Stage ad Ocular Micrometers

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

Total count of RBC using Haemocytometer.

Total count of WBC using Haemocytometer.

Slide Preparation

Buccal Smear.

Mitosis in onion root tip squash.

Squash preparation of Grass hopper testes.

Study of prepared slides of histology.

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

GENETICS

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

Male & Female identification of Drosophila.

Observation of common Mutants of Drosophila.

Human Blood Grouping.

BIOTECHNOLOGY

Study of prepared slides, Models or specimen.

Escherichia coli, Bacteriophage, Plasmid.

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

Visit to Biotechnology lab and Report – compulsory.

II B.Sc (Zoo)	ALLIED PRACTICAL - III BOTANY	19ABP404
SEMESTER - IV		HRS/WK – 3
ALLIED PRACTICAL -III		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.

III B.Sc (Zoo)	BIOSTATISTICS AND COMPUTATIONAL BIOLOGY	20Z0509
SEMESTER - V		HRS/WK – 5
CORE - V		CREDIT – 5

Objective:

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

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: 20Z0509					COURSE TITLE: BIOSTATISTICS AND COMPUTATIONAL BIOLOGY									HOURS: 5	CREDITS :5
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:

Gupta SP 1996. Statistics –S. Chand and Co., New Delhi.

Jerold H. Zar 1984. Bio Statistical analysis [2nd edition] printice Hall of International edition.

Goutham Roy 2002. Introduction to Computing and computing lab and Cad Books and allied [pvt]ltd. Kolkata.

Christine Solomon. MS. OFFICE for Win – Microsoft office press. Developing Application with MS-OFFICE – Microsoft Office Press.

Cynthia Gibbs. Developing Bioinformatics Computer Skills. Sheoff Publishers & Distributors Pvt.Ltd., Mumbai.

Arthur. M. Lesk 2003. Introduction to Bioinformatics, Oxford University Press, New Delhi.

Arthur. M. Lesk, Introdution to protein Structures Oxford University Press, New Delhi, 2000

Baxevanis, A and Outllette 2005. Bioinformatics a practical guide to the analysis of genes and proteins, Willy – Intersience, Hoboken, NJ. USA.

III B.Sc (Zoo)	DEVELOPMENTAL BIOLOGY & IMMUNOLOGY	20Z0510
SEMESTER - V		HRS/WK – 5
CORE – VI		CREDIT – 5

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: 20Z0510					COURSE TITLE: DEVELOPMENTAL BIOLOGY & IMMUNOLOGY									HOURS: 5	CREDITS :5
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:

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

III B.Sc (Zoo)	ANIMAL PHYSIOLOGY	20Z0511
SEMESTER - V		HRS/WK – 5
CORE - VII		CREDIT – 5

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: 20Z0511					COURSE TITLE: ANIMAL PHYSIOLOGY									HOURS: 5	CREDITS :5
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 [Co2 and O2] – Respiratory quotient. Circulation Types, Composition, Properties and Function of Blood – Human – Cardiac Cycle – Cardiac Rhythm – Origin of heart Beat – Regulation of heart Beat – ECG – Blood Pressure – Factors Contributing to heart Problems – coronary circulation.

UNIT – III

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 langherhans, Testis and Ovary.

Reference Books:

Sambasivaiah, Kamalakara rao and Augustine chellappa 1990. A Text book of Animal physiology and ecology, S. Chand & co., Ltd., New Delhi – 110 055.

Parameswaran, Anantakrishnan and Ananta Subramanyam, 1975. Outlines of Animal Physiology, S. Viswanathan [printers & Publishers] Pvt. Ltd.

William S. Hoar, 1976. General and comparative physiology, prentice Hall of India Pvt. Ltd., New Delhi. 110 001.

Wood.D.W, 1983, Principles of Animal Physiology 3rd Ed.,

Prosser,C.L. and Brown, 1985, Comparative Animal Physiology, Satish Book Enterprise, Agra – 282 003.

III B.Sc (Zoo)	ELECTIVE-I APPLIED ENTOMOLOGY	20Z0512A
SEMESTER - V		HRS/WK – 5
ELECTIVE-I (Compulsory)		CREDIT – 5

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: 20Z0512A					COURSE TITLE: ELECTIVE-I APPLIED ENTOMOLOGY										HOURS:5	CREDITS:5
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 termities – 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:

Vasantharaj David and T. Kumaraswami 1988. Elements of Economic Entomology Popular Book Depot, Chennai.

Nayar, K.K., Ananthakrishnan, T.N. and B.V. David 1992 General and Applied Entomology Tata McGraw, New Delhi.

P.G. Fenemore and Alka Prakash 1997 Allied Entomology, Wiley Eastern Ltd., New York.

Wigglesworth J.B., 1994. Insect Physiology, Chapman and Hall, London.

Temphare D.B., 1984 A. Text Book of Insects Morphology, Physiology and Endocrinology. S. Chand and Co., New Delhi.

A.Upadhyaya, K.Upathyaya and N.Nath, 2003 Biophysical chemistry, Principles and Techniques,3rd Ed, Himamalaya publishing house.

H.B.Bull, F.H.Davis, 1971. An introduction to physical Biochemistry 2nd Ed, Philadelphia

Gurumani.N 2006. Research methodology for biological sciences MJP publ. Chennai.

III B.Sc (Zoo)	BIOPHYSICS	
SEMESTER – V		HRS/WK – 5
ELECTIVE		CREDIT – 5

Objective:

- To impart an overview of basic biophysical characters of the cell

Course Outcome

On completion of the course students will be able

CO1: To describe the molecular structure of cell

CO2: To understand the cell and cellular organization.

CO3: To understand the tools in cell biology.

CO4: To describe the cell growth and cell cycle

CO5: To understand cell interactions and signaling

SEMESTER V	COURSE CODE:					COURSE TITLE: BIOPHYSICS									HOURS: 5	CREDITS :5
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

Molecular Biophysics

Unit I: Atomic & Molecular structure : Structure of atom, Quantum numbers, Pauli's exclusion principle, Periodic table, Concept of bonding; valence of carbon; hybridizations of carbon; hybridizations of nitrogen & oxygen; Secondary bonding: weak interactions, hydrogen bonding; Bonds within molecules- Ionic, covalent, Hydrogen, Electrostatic, Disulphide & peptide bonds, Vander Waals forces, Structural isomerism; geometrical isomerism; optical isomerism & optical activity. Acid & Bases, mole concept, Molarity & Normality, weak acids, Ampholyte, pH, Calculations of pH from H & OH concentrations, measurements of pH Redox potential :Oxidation –Reduction.

Cellular BioPhysics

Unit II: Cell Organization

Cell as the basic structural unit, Origin & organization of Prokaryotic and Eukaryotic cell, Cell size & shape, Fine structure of Prokaryotic & Eukaryotic cell organization (Bacteria, Cyanobacteria, plant & Animal cell), Internal architecture of cells, cell organelles.

Unit III: Tools in Cell Biology

Light microscope, Resolving Power, Phase contrast microscope, Dark field microscopy, Light scattering at cell boundaries, Polarization microscopy, Fluorescence microscopy, Electron microscopy, High Voltage Electron Microscopy, Scanning Electron Microscopy (SEM), Scanning Transmission Electron Microscopy (STEM).

Unit IV: Cell Growth & Division

Kinetics of cell growth, The Cell Cycle, Interphase-G1, S, G2, M molecular events at different cell cycle phases, A cytoplasmic clock times, cell cycle in early embryogenesis, Polypeptide Growth Factors &Control of cell proliferation, Mitosis & Cell division Molecular mechanism, Events in mitosis, Role of mitotic apparatus, Meiosis & Sexual reproduction, Molecular mechanism of meiosis.

Unit V: Cell-Cell Interaction

Connection between the cell and its environment, Glycocalyx, Extracellular Matrix, collagen, Elastin, Fibronectin, Lamin, Proteoglycans, Integrins, Cell Junctions, Desmosomes, Gap junction, Tight Junctions, Plasmodesmata, Synapse and synaptic vesicles. Cell Signaling, General principle of cell signaling.

Text books:

De Robertis E.D.P. and De Robertis E.M.P. (1981), Essentials of cell and molecular Biology, Holt sounders International Editions.
Lehninger A. (1981), Biochemistry, Butter Worth Publication.
Barrow. C. (1974), Physical Chemistry For Life Sciences, McGraw-Hill

Reference Books

Ackerman E.A. Ellis, L.E.E. & Williams L.E. (1979), Biophysical Science, Prentice-Hall Inc.
Berns M.W. (1982), Cells, Holt Sounders International Editors.
Bloomfield V.A. and Harrington R.E. (1975), Biophysical chemistry, W.A.Freeman and CO.
Bulter l.A.V. And Noble D.Eds. (1976), Progress in Biophysics and Molecular Biology (all volumes) pergamon, Oxford.
Dickerson R.E.& Geis I. (1972), Proteins: structure, function and evaluation,Benjamin.
Hughes W. (1979), Aspects of Biophysics, John willey and sons.

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

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					COURSE TITLE: ENVIRONMENTAL BIOLOGY									HOURS: 5	CREDITS :5
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,N2 & S] sedimentary cycle, [phosphates]. **Animal association** - Intra specific and inter specific - colony formation, social organization, predation, parasitism, commensalisms, mutualism, inter specific competition – competitive principle or Gause's principle.

UNIT – IV

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:

Kotpal. R.L, and N.P. Bali, 1986. Concepts of Ecology, Vishal Publications, New Delhi – 7
Rastogi V.B, and M.S. Jayaraji, 1988 – 1989 Animal Ecology and Distribution of animals, Kedar nath, Ram Nath Meerut – 250 001.
Clark, G.L. 1954, Elements of Eology, John wiley & Sons Inc., New York, London.
Ananthakrishnan, T.N, and S. Viswanathan, Principles of Animal Ecology.

Eugene P. Odum, 1971. Fundamentals of ecology, Saunders International Student Edition, W.B. Saunders Company, Philadelphia London, Toronto.
Verma, P.S and Agarwal 1986, Environmental Biology, S. Chand & Co Ltd.
New Delhi.

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

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					COURSE TITLE: ECONOMIC ZOOLOGY									HOURS: 5	CREDITS :5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	
CO1	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5
CO2	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5
CO3	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5
CO4	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5
CO5	5	5	5	5	5	5	4	4	3	5	5	2	5	4	5	4.5
Mean Overall Score																4.5

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:

Sukla, G.S. and Upadhyay, V.B., 2000 Economic Zoology – ISBN – 81- 7133 -137 -8 Rastogi Publication, Meerut, India

Jawaid Ahsan and Subhas Prasad sinha – 2000 A Handbook on Economic Zoolgy - Chand & co., Ltd., New Delhi.

Ashok Kumar and Prem Mohan Nigam, 1991 Economic and Applied Entomology Emkay Publication, New Delhi.

Shammi,Q.J. and Bhatnagar, S., 2002 Applied Fisheries Agrobios [India],Jodhpur - India

Major Hall, C.B. 2005 Ponds and Fish culture. Agrobios [India], Jodhpur - India

Keith Wilson, N.D.P., 2005 A Handbook of Poultry Practice. Agrobios [India], Jodhpur - India

Banerjee, G. C. 1992 Poultry – III – Edition Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Banerjee, 1988 A Text book of Animal Husbandry – VIII- Edition xford & IBH Publishing co. Pvt. Ltd., New Delhi.

Kaushish, S.K., 2001 Trends in livestock Research. Agrobios [India], Jodhpur - India

Ismail, S.A1997. Vermicology the Biology of Earth worm orient Longman, India.

Mary Violet chrishty .A 2008 Vermi techonology MJP Publ. Chennai.

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

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					COURSE TITLE: EVOLUTION									HOURS:5	CREDITS :5
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:

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

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

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					COURSE TITLE: ELECTIVE-II AQUACULTURE									HOURS: 4	CREDITS :5
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 diet. 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 ,NewDelhi

Principles and practices of Pond Aquaculture, Annan, J.F, R.O.Smiterman and G. Tehebenoglous

(Eds) ,1983 , Oregan State University , U.S.A.

2. Home Aquarium:aquatic gema and tropical fish ,1970, Makinos Japan Publications

III B.Sc (Zoo)	Skill Based Subject SERICULTURE	20EZ618B
SEMESTER - VI		HRS/WK – 5
Skill Based Subject		CREDIT – 4

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 :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	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 import 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:

Ganga, G. 2003: comprehensive sericulture Vol-l, Mariculture – Oxford –IBH Puubl. Co. India.

Ganga, G. 2003: comprehensive sericulture Vol –II Silkworm rearing – Oxford – IBH Publ. Co. India.

Ganga, G. and Sculochana Chetty, J. 1997: An Introduction to sericulture Oxford – IBH Publ. Co. India.

III B.Sc Zoology	ELECTIVE – II PUBLIC HEALTH AND HYGIENE	20EZ513B
SEMESTER – VI		HRS/WK – 4
ELECTIVE –II (Optional)		CREDIT – 2

Objective:

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

Course Outcomes

On completion of the course students will be able

CO1: To understand public health and hygiene

CO2: To realize environment and health hazards

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

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

CO5: To know the health education in India

SEMESTER VI	COURSE CODE: 20EZ513B					COURSE TITLE: ELECTIVE - II PUBLIC HEALTH AND HYGIENE									HOURS:4	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	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 **12Hours**

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

UNIT-II **12Hours**

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

UNIT-III **12Hours**

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

UNIT-IV **12Hours**

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

UNIT-V **12Hours**

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

Text Books:

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

Reference Books:

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

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

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)	CORE PRACTICAL - IV ENVIRONMENTAL BIOLOGY, ECONOMIC ZOOLOGY AND EVOLUTION ENVIRONMENTAL BIOLOGY	20ZOP64
SEMESTER – VI		HRS/WK – 3
CORE PRACTICAL - IV		CREDIT – 5

Estimation of Dissolved oxygen, salinity, pH, Free CO2, Carbonate and Bicarbonates in water samples.
Use of rain gauge, Maximum and Minimum thermometer, Hygrometer and Anemometer.
Plankton study – fresh water and Marine plankton.
Study of natural ecosystem and field report.

ECONOMIC ZOOLOGY:
Study of the following prepared slides / specimens.
Earthworm types [any two] – [vermiculture].
Megacolex mauritii – south Indian species – surface crawlers.
Drawida modesta – 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

SEMESTER	PART	CODE	COURSE TITLE	HOURS	CREDITS
III	III	AZCMB301	Classical Genetics & Biostatistics (II Year Micro Biology)	8	6
IV	III	AZMB402	Solid waste Management (II Year Micro Biology)	8	6
IV	III	AZBC401T	Advanced Zoology-Theory (II Year Bio – Chemistry)	5	4
IV	III	AZBP401	Advanced Zoology-Practical (II Year Bio – Chemistry)	3	2
III & IV	IV	EVS301S & EVS401S	Environmental Science (All UG B.Sc/B.A/B.COM/B.C.A	3	2

II B.Sc (MB)	CLASSICAL GENETICS & BIO-STATISTICS	AZCMB301
SEMESTER - III		HRS/WK – 8
ALLIED		CREDIT – 6

(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: AZCMB301					COURSE TITLE: CLASSICAL GENETICS & BIO-STATISTICS									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	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 and polyhybrid cross - Mendel's laws of inheritance - hybrid vigour – gene expressivity - pleiotropism – incomplete dominance – complementary genes - epistasis - supplementary genes – duplicate genes – lethal genes – atavism – multiple genes – polygenic inheritance – continuous and discontinuous characters. Multiple Alleles and linkage - Characters and theories of multiple alleles – sub alleles and iso alleles - ABO Blood Group inheritance - Rh factor – linkage and linkage group – history - linked genes – complete and incomplete linkage – significance of linkage.

Unit – II : Recombination in Eukaryotes :

Mechanism – stage specificity - cytological evidence – frequency of crossing over – factors controlling crossing over – mitotic and meiotic crossing over – somatic and germinal crossing over – significance of crossing over - construction of chromosome maps – history of chromosomes – size, shape, structure, types and physiology of chromosomes- gene concept - gene function.

Unit – III: Molecular, Human and cytogenetics

DNA as the genetic material – nucleic acids – structure of DNA , gene – enzyme relationship - euploidy - aneuploidy – chromosomal aberrations - Pedigree analysis – human chromosomes – eugenics and euphenics – inbreeding, outbreeding and hybrid vigour - population genetics.

BIO-STATISTICS

Unit – IV:

Introduction – Scope – Definition – Importance – Functions – Data – Data collection – Methods of data collection – Classification of Data – Tabulation of Data – Diagramatic, Graphical presentation of Data – Histogram – Frequency polygon – Oogive curves. Measures of central tendency _ Arithmetic mean – Median – Mode - Measures of dispersion – range – quartile deviation – standard deviation and coefficient of variation – mean deviation – skewness – kurtosis.

Unit –V:

Correlation – simple correlation – Rank correlation – Regression – Probability – Addition theorem – Multiplication theorem – Permutation and combinations - Test of significance – Hypothesis testing – Null hypothesis – alternative 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.

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: AZMB402					COURSE TITLE: 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, shreeding 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.

II B.Sc (BC)	ADVANCED ZOOLOGY For the students admitted in the year 2015	AZBC401T
SEMESTER - IV		HRS/WK – 5
ALLIED		CREDIT – 4

Objective:

- To understand the basic concepts of animal kingdom, Invertebrates, Chordates, human physiology, 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 and Chordate species

CO2: To describe physiology of human organ systems

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: AZBC401T					COURSE TITLE: ADVANCED ZOOLOGY										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	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 AND CHORDATES- Structural and functional details of phylum– Protozoa-*Plasmodium vivox*, Helminthes-*Taenia solium*, Annelida-Earthworm- Digestive system, Prochordata – amphioxus- Morphological details of chordates- Pisces-shark, Amphibia -Frog, Reptiles- Calotes, Aves- pigeon, Mammalia- Rat.

Unit: 2

PHYSIOLOGY- Digestion and absorption of carbohydrates proteins and lipids. **Respiration** –exchange and transport of Gases (CO2 & O2) Bohr's effect. **Circulation:**– Structure and functions of human heart, **Excretion** – ornithine cycle Osmo regulation in fresh water and marine animals. **Nerve Physiology:** Structure of Neuron, Conduction of Nerve impulse. **Muscle Physiology:** Types of Muscle, Theories of Muscle contraction. **Endocrinology:** Structure, secretions and functions of Pituitary, Thyroid, adrenal, islets of langerhans, Gonads –Pheromones.

Unit: 3

MOLECULAR BIOLOGY AND HUMAN GENETICS – Histological techniques – Fixation- selective fixatives- Embedding- Sectioning and Staining Principles. Mendals 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. Fossil and Fossilization, Dating of Fossils, Geological timescale.

Books for reference:

BIODIVERSITY OF INVERTEBRATES AND CHORDATES:

1. Ekambaranatha Ayyar & T.N.Ananthakrishnan (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 AND ENDOCRINOLOGY:

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

MOLECULAR BIOLOGY AND HUMAN GENETICS:

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

DEVELOPMENTAL BIOLOGY

8. Verma.S and Agarwal V.K(2000) Chordate Embryology S.Chand & Co. New Delhi.
9. Balinsky.B.I (1981) An Introduction to Embryology S.Chand & Co. New Delhi.
10. Saunders.J.W (1982) Developmental Biology – Pattern and Principles, Macmillan New York.

ECOLOGY AND EVOLUTION

11. Text book of Ecology & Animal Distribution by P.S.Verma V.K.Agarwal S.Chand & Co. New Delhi.
12. Odum E.P.Basic Ecology (1983) Saunders College Publishing's New York.
13. Arumugam.N (2002) Organic Evaluation, Saras Publication., Nagercoil.

II B.Sc (BC)	ADVANCED ZOOLOGY- PRACTICAL	AZBP401
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

a. Squash preparation of onion root tip for mitosis.

b. Human pedigree construction for a family data.

c. Mouth parts- Honey bee and Mosquito.

SPOTTERS

T.S. of Chick embryo- 24hrs, 48hrs, 72hrs and 96hrs, *Taenia solium*, Plasmodium, T.S. of Pituitary gland, Adrenal gland, Thyroid gland, Testis and Ovary.

II YEAR	ENVIRONMENTAL SCIENCE	EVS301S/ EVS401S
SEMESTER – III		HRS/WK – 3
Ability Enhancement Course		CREDIT – 2

(For All UG II Year Students Any One Semester)

Objective:

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

Course 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: EVS301S/ EVS401S					COURSE TITLE: ENVIRONMENTAL SCIENCE									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: exdploitation, 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

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. 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

Rw;Wr; NHy; fy;tp

Unit-myF/ 1Rw;Wr; NHapay; kw;Wk; ,aw;if ts';fs;

Rw;Wr;NHy; ,aypd; ,yf;fzk;. nehf;fk;. Kf;fpaj;Jtk;? fhLk; mjd; ts';fSk;. fhLfs; mHpg;g[. Ru';fk;. ePh; njf;f miz?

ePh; Mjhu';fs; : gad;ghLfs;. bts;sk;. twl;rp/ fdpk ts';fs;? Ruz;ly;. msthf vLj;jy; (k) gad;ghL: czt[ts';fs;? czt[k; mjd; epiw FiwfSk;. mjp jPtpu nka;r;ry;. g{r;rpbfhy;yp (k) caph;bfhy;ypapd; Fiwfs;. ePh; nj';Fjy;. cg;g[j;jd;ik/ rf;jp ts';fs; ? rf;jpapd; njitfs;. g[Jg;gpf;f Toa (k) g[Jg;gpf;f ,ayhj rf;jpfs; epy ts';fs; ? wpytsf;Fiwt[. epyr;rhpt[. kz;rhpt[/ kw;Wk; ghiytdkhFjy;. ,aw;if ts';fspd; ghJfhg;g[ed;ikfSk;/

Unit-myF II) NHy;epiy kz;ly';fs;

nfhl;ghL. mikg;g[kw;Wk; bray;ghL: cw;gj;jpahsh;fs;. Efh;nthh;fs;. kw;Wk; rpijg;gth;fs; ? NH;epiy kz;lyj;jpd; Mw;wy; xl;lk; NHpay; tHpKiw tsh;r;rp. czt[r;r';fpyp. czt[tis. NH;epiy kz;ly';fs; tiffs;. jd;ikfs;. mikg;g[kw;Wk; bray;gh:L? fhl;L NH;epiy kz;lyk;. g[y;btsp NH;epiy kz;lyk;. ghiytdk; kw;Wk; ePh;r;NH;epiy kz;lyk;/

Unit-myF III) caphpag; gy;tifik

tiuaiw. tiffs;. caphpag; gy;tifikapd; gad;fs;. ,e;jpah Xh; caphpakpif gy;tifik kz;lyk;. caphpa kpif gy;tifik ,l';fs;. caphpay; gy;tifikf;F mr;RWj;jy;. caphpa gy;tifikapd; ghJfhg;g[/

Unit-myF IV) Rw;Wr;NHy; khRghL

fhw;WkhRghL. ePh; khRghL. kz; khRghL/ fly; khRghL/ ,iur;ry; khRghL/. mdy; khRghL/ kw;Wk; fjphpaf;f khRghL/. jplfHpt[nkshd;ik. fhuzpfs;. tpist[fs;. jLf;Fk;Kiw kw;Wk; ghJfhg;ghd mg;g[wg;gLj;Jk; Kiw nghplh; nkyhz;ik. bts;sk;. epyeLf;fk;. g[ay;. epyr;rhpt[kw;W MHpg;nguiyfs;/

Unit-myF V).rK:f rpf;fy;fSk; kf;fs; bgUf;fKk; Rw;WNHYk;

ePh;ts ghJfhg;g[. kiHePh; nrfhpg;g[. ePh;ts nkyhz;ik ? Rw;Wr;NHy; tiuKiw rpf;fy;fSk; mjd; ePh;f;Fk; fhuzpfSk;. thdpiy khw;w';fs;. cyfbtg;gkakhjy;. mkpykiH. Xnrhd; rpijt[. fjphpaf;f tpgj;Jfs; kw;Wk; nghplh;fs; ePh;gphpif KfL rPuikg;g[. Rw;Wr;NHy; ghJfhg;g[rl;lk;. td caphpdg; ghJfhg;g[rl;lk;. tdg;ghJfhg;g[rl;lk;. Rw;Wr;NHy; tpHpg;g[zh;t[. kf;fs; bjhifg; bgUf;fk;. Rw;Wr;NHy; (k) kdpj eyd;. kdpj eydpYk;. Rw;Wr; NHypYk; jfty; bjhHpy; El;gjj;jpd; g';F/

II B.Sc (MB)	GENETICS	AZBC402
SEMESTER - III		HRS/WK - 6
ALLIED		CREDIT - 5

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

Objective:

- To provide basic knowledge in the field of genetics, mutation, human genetics and population 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 chromosomal and gene mutation.

CO3: To define sex linked inheritance.

CO4: To describe human genetics

CO5: To acquire knowledge on population genetics

SEMESTER IV	COURSE CODE: AZBC402					GENETICS										HOURS: 6	CREDITS :5
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)										MEAN SCORE OF CO'S	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10		
CO1	5	5	5	5	4	4	5	3	3	5	5	2	5	2	4	4.1	
CO2	5	5	5	5	4	4	5	3	3	5	5	3	5	2	4	4.2	
CO3	5	5	5	4	4	4	5	3	3	5	5	2	5	2	4	4.1	
CO4	4	5	4	4	4	4	5	3	3	5	5	2	5	2	4	4.0	
CO5	5	5	4	5	4	4	5	3	3	5	5	3	5	2	4	4.1	
Mean Overall Score																4.1	

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: Genetics and Mendel's laws
Basics of Mendelian inheritance – Interaction of genes – complementary factors, supplementary factors, inhibitory and lethal factors – atavism. Blood groups and their inheritance. Chromosomes - the vehicle of inheritance – Chemical basis of inheritance. Molecular basis of genetic material - genetic code – gene function – operon concept. Inborn errors of metabolism.

Unit-II: Gene Mutations
Linkage and Crossing over – Chromosome maps – Chromosomal mutation and gene or point mutation – mutagens. Chromosomal aberrations – numerical and structural – examples from humans.

Unit-III: Sex Inheritance
Sex determination - sex linked inheritance – extra chromosomal inheritance – kappa particles in paramecium, milk factor in mice.

Unit-IV: Human Genetics
Pedigree analysis – Human karyotype – sex dtermination, barr body and drumstick chromosome – anomalies in sex chromes and autosomes – Congenital malformation – Genetic disorders in man – Eugenics and Euphenics – Euthenics – Bioethics.

Unit-V: Population Genetics
Population – Gene pole – Genefrequency and genotypic frequency – Genetic equilibrium and Hardy Weinberg Law – Factors affecting gene frequency – Evolutionary forces of factors. Applied Genetics: Animal breeding – heterosis, inbreeding, out breeding. Out crossing and hybrid vigour.

Text Books:
Verma, P.S and Agarwal, V.K 2005 ' Cell Biology, Genetics, Molecular Biology, Evolution & Ecology', S. Chand and Co., New Delhi

Reference books:
5. Veer Bala Rastogi. 1992 .A textbook of Genetics, 9th edition, Keda Nath Ram Nath, New Delhi.
6. Karvita B. Aluwalia , 1991. 'Genetics' Wiley Eastern Ltd, New Delhi .
7. Sarin, C.1990. ' Genetics' Tata Mcgraw – Hill Publishing Co ., Ltd., New Delhi.
8. Burns. G.W .and Boltsmo, P.J. 1989. The Science of Genetics' Macmillan publishing Co ., New York.

II B.Sc (MB)	ENDOCRINOLOGY	AZMB402
SEMESTER - IV		HRS/WK - 6
ALLIED		CREDIT - 5

Objective:

- To make the students to learn the objectives and scope of comparative endocrinology, anatomy, morphology and histology of endocrine tissues of vertebrates, crustacean and insect endocrine organs and their functions.

Course Outcome

On completion of the course students will be able

CO1: To describe the morphology of pituitary gland and its hormones

CO2: To understand the structure of thyroid and thyroid hormones

CO3: To describe the structure and functions of pancreas and adrenal glands

CO4: To understand the vertebrate reproductive endocrinology

CO5: To understand the insects and crustacean endocrinology

SEMESTER V	COURSE CODE: AZMB402					ENDOCRINOLOGY										HOURS:6	CREDITS :5
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: Pituitary Gland
General characteristics of hormones-Pituitary gland-structural organization-Pituitary hormones functions - hypothalamic control.

Unit–II: Thyroid Gland
Thyroid gland-structural organisation- metabolic effects of thyroid hormone- effects of thyroid on reproduction – Parathyroid – structure – function of parathyroid hormone.

Unit–III: Pancreas and Adrenal Glands
Structure of pancreas- function of Insulin and glucagon- Adrenals – structural organization, functions of cortical and medullary hormones.

Unit–IV: Vertebrate Reproductive Endocrinology
Structure of mammalian testis and ovary-male and female sex accessory organs- hormones of testis and ovary – estrus and menstrual cycle –hormones of pregnancy – parturition – hormonal control of lactation.

Unit–V: Insect and Crustacean Endocrinology
The concepts of neurosecretion – Endocrine system in crustacea – endocrine control of moulting and metamorphsis – Neuroendocrine system in insects- endocrine control of moulting and metamorphosis.

Text Books
1. Turner C.D, 1966, General Endocrinology. 4th Ed, W.B.Saunders Co., London.
2. Bentley P.J., 1985. Comparative Vertebrate Endocrinology. S.Chand and Co.,
3. Barrington E.J.W., 1968. An Introduction to General and Comparative endocrinology. Academic press, London.

Reference Books
1. Harris.G.W. and B.T.Donovan (Ed) 1968. The Pituitary Gland. Vol.3
2. Williams.R.M, 1974, Text Book of Endocrinology 5th Ed.
3. BentleyP.J. 1982. Comparative Vertebrate Endocrinology Cambridge University Press.
4. Michael .P. 1968. Endocrinology and Human Behaviour. Oxford University Press, New York.

II B.Sc (MB)	ENDOCRINOLOGY-PRACTICAL	AZBCP401S
SEMESTER - IV		HRS/WK – 3
ALLIED		CREDIT -

MAJOR PRACTICAL

1. Demonstration of Male and Female reproductive systems in cockroach

2. Demonstration of nervous system of Prawn

MINOR PRACTICAL

1. Prawn - Appendages
2. Mouth Parts - Honey Bee and Mosquito

SPOTTERS

1. Histology of ovary, accessory glands, corpus allatum and brain in insects

2. Histological study of pituitary, adrenal, testis, ovary, corpus luteum, pancreas and thyroid gland

3. Demonstration of Ovariectomy in cockroach.

4. Vaginal smear showing various stages of estrus cycles.

II B.Sc (MB)	ENTOMOLOGY	AZMB402
SEMESTER - IV		HRS/WK - 6
ALLIED		CREDIT - 5

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 morphology of insects

CO2: To understand the physiology of insects

CO3: To know pests of agriculture

CO4: To describe pest control methods and managements

CO5: To understand the beneficial and vector insects

SEMESTER V	COURSE CODE: AZMB402					ENTOMOLOGY										HOURS:6	CREDITS:5
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: Insect Morphology
Insect taxonomy upto oders – Salient features with sutable examples of the insect orders – Thysanura, Odonata, Isoptera, Orthoptera, Hemiptera, Coleoptera, Lepidoptera, Hymenoptera and Diptera - Insects collection – Preservation – Identification – insect head – types of antennae – mouth parts and wing venation.

Unit–II: Insect Physiology
Structure and physiology of integumentary, digestive, excretory, circulatory, respiratory, endocrine, reproductive and nervous system.

Unit–III: Agricultural Entomology
Insect – pests out break – assessment of insect population – Identification, seasonal history, biology, nature of damage and control measures of major pests of paddy, sugarcane, vegetables (Brinjal).

Unit–IV: Principles and methods of Pest Management
Principles of Insect control – Prophylactic measures – cultural, mechanical, physical methods– Genetic control and quarantine. Biological control : parasites, Predators and Microbial agents. Chemical methods: Pesticides- general classification – classification base4d on mode of action, mode of entry and Biopesticides: Integrated Pest Management (IPM) – definition, Integration of methods – potential components – need for IPM and uses.

Unit–V: Beneficial insects and Vector insects
Sericulture: biology of silk worm, silk gland, cultivation of mulberry plants, rearing silkworm and uses of silk – Apiculture: types of bees, bee colony, life history, Beekeeping accessories and byproducts of bees and its uses. Useful insects – Biology and control measures of important insect vectors – mosquitoes and houseflies.

Text Books
1. Temphare D.B. 1984. A Text Book of Insect Morphology, Physiology and Endocrinology. S.Chand and Co., New Delhi.
2. Chapman R.F. 1982. The Insect Structure and Functions. English Language Book society, Hooder Strongron.

Reference Books
1. Vasantharaj David.B. and V.V. Ramamurthy (2011). Elements of Economic Entomology, Namrutha publications, Chennai 600 116.
2. Temphare, D.B. (2009). Modern Entomology, Himalaya publishing Mumbai.
3. Ambrose, Dunston P,. (2004). The Insects: Structure, function and Biodiversity. Kalyani publishers, Ludhiana – New Delhi – Chennai.
4. Chapman, R.F. (2002) The Insect structure and functions. English Languages Book Society, Hooder Strongton.
5. Mike, W,. Service (1999). Medical Entomology for Student, Cambridge Press.
6. Nayer, K.K., Ananthakrishnan T.N. and David B.V. General and Applied Entomology. Mc.Grow Hill Publications, New Delhi.

7. Rathanswamy, G. K. (1986). AHandbook of Medical Entomology and Elementary Parasitology. S. Viswanathasn Printers & Publishers Pvt. Ltd.
8. Srivastava, K.P. (1993). A Text Book of Applied Entomology. Vol I & II Kalyani Publishers, New Delhi.
9. P.G. Fenemore, Allaprakash, (1992). Applied Entomology : Wiley Eastern Ltd., Delhi.
10. Ullal,. S.R. and M.N. Narasimhanna (1987). Hand book of practical sericulture, Central silk board (Ministry of textiles – Government of India), United Mansion, 39, Mahatma Gandhi road, Bangalore.

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

Major Practical

1. Methods of harmful insect collection, preservation and submission of insect box.
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 and Odontopus).

Spotters

1. Histological slides – T.S. of foregut, midgut and hindgut, 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. Collection and Identification of medically important arthropods (Moquitoes, house flies, lice and mites).

QUESTION PAPER PATTERN

THEORY EXAMINATION

Continuous Internal Assessment (CIA) 25marks

1. Two Internal Examinations	15 marks
2. Assignment/ Seminar	5 marks
3. Attendance	5 marks
Total	**25 marks**

Semester Examination (75 marks)

Time: 3Hrs **Max. Marks: 75**

A Question paper consists of three parts

Part-A
10 very short answer 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. (10x2=20 Marks)

Part-B
Short Answers (300 words) 5 questions each 5 marks. (5x5=25 Marks)

Part-C
Essay questions (1200 words) 2 questions each 15 marks. (2x15=30 Marks)

TOTAL **75 Marks**

PRACTICAL EXAMINATION

Continuous Internal Assessment (CIA) (40 marks)

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

External Examination (60 marks)

Time: 3 Hrs

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

QUESTION PAPER PATTERN
(For Environmental Science)

THEORY EXAMINATION

Continuous Internal Assessment (CIA) 25 marks

1. Two Internal Examinations	15 marks
2. Assignment/ Seminar	5 marks
3. Attendance	5 marks
Total	**25 marks**

Semester Examination (75 marks)

Time: 3Hrs **Max. Marks: 75**

A Question paper consists of three parts

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

Part-B
5 questions are to be answered 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	
Choose the answer 20 questions each 1 mark.	(20x1=20 Marks)
Part-B	
Short Answers (300 words) 5 question each 5 marks.	(5x5=25 Marks)
Part-C	
Essay questions (1200 words) 2 questions each 15 marks.	(2x15=30 Marks)
Field work	
TOTAL	**75 Marks**