NOTIFICATION

Sub: Revision of syllabus and examination pattern, regulations pertains to M.Sc. Applied Zoology from the Academic year 2017-18.

Ref: 1. Decision of the Faculty of Science & Technology Meeting held on 03-03-2017.

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The Board of Studies in Applied Zoology (PG) which met on 20-12-2016 has recommended to revise the regulation, scheme of examination pattern and syllabus of M.Sc. Applied Zoology from the academic year 2017-18.

The Faculty of Science and Technology and the Academic Council at their Meetings held on 03-03-2017 and 30-03-2017 respectively have approved the above said proposal and the same is hereby notified.

The Revised syllabus, scheme of examination pattern & regulations of M.Sc Applied Zoology Course is annexed. The contents may be downloaded from the University Website i.e., www.uni-mysore.ac.in.

Draft approved by the Registrar

Sd/-
Deputy Registrar (Academic)

To:
1. The Registrar (Evaluation), University of Mysore, Mysore.
2. The Principal, Maharani’s College for Women (PG wing), Mysore - for needful.
3. The Dean, Faculty of Science & Technology, DOS in Physics, MGM.
4. The Chairman, BOS in Applied Zoology, DOS in Zoology, MGM.
5. The Co-ordinator, Directorate of Online and Outreach Program, Parakalamata, Manasagangotri, Mysore.
6. The Director, College Development Council, Moulya Bhavan, Manasagangotri, Mysore.
7. The Deputy/Assistant Registrar/Superintendent, AB and EB, UOM, Mysore.
8. The P.A. to the Vice-Chancellor/Registrar/Registrar(Evaluation), UOM., Mysore.

University of Mysore

Choice Based Credit Based System

Proposed Revised Syllabus of

M. Sc., Applied Zoology Programme

With effect from 2017-2018
### M. Sc., Applied Zoology Course structure

<table>
<thead>
<tr>
<th>Semester</th>
<th>Title of the papers</th>
<th>HC/SC</th>
<th>Credit pattern L:T:P</th>
<th>Total Credit</th>
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<tbody>
<tr>
<td>I SEM</td>
<td>Animal Systematics</td>
<td>HC-1</td>
<td>2:0:2</td>
<td>4</td>
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<td></td>
<td>Animal Physiology</td>
<td>HC-2</td>
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<td>4</td>
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<td>Cell &amp; Molecular Biology</td>
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<td>Wildlife Biology &amp; Conservation*</td>
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<td>Evolutionary Biology*</td>
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*Students have to opt any two soft core papers in this semester

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<td>II SEM</td>
<td>Aquaculture &amp; Fishery Technology</td>
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<td>Genetics</td>
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<td>Environmental Biology</td>
<td>HC-6</td>
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<td>Apiculture &amp; Vermiculture *</td>
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<td>Animal Behavior*</td>
<td>SC-6</td>
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<td>Parasitology**</td>
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<td>Ornithology**</td>
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** Non Zoology M. Sc., Students have to opt any one open elective paper

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<tr>
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<td>Animal Husbandry</td>
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<td>Animal Biotechnology</td>
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<td>Immunology &amp; Toxicology*</td>
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<td>Basic Zoology**</td>
<td>OE-4</td>
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<td>4</td>
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<tr>
<td></td>
<td>Sericulture Technology**</td>
<td>OE-5</td>
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<td>Major Research Project</td>
<td>HC-T1 &amp; T2-PRJ</td>
<td>0:2:6</td>
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<td>Zoo Management*</td>
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<td>4</td>
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<td></td>
<td>Vector Biology*</td>
<td>SC-10</td>
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*Students have to opt any one soft core paper in this semester

**Note:** Hard core 48 Credits (Minimum required 42 Credits)
Soft Core 40 Credits (Minimum required 16 Credits)
Open Elective = Minimum required 04 Credits
Total Credits required for completing M. Sc., programme is 76.
M.Sc., APPLIED ZOOLOGY I Semester
A Z 1.1 (Hard Core - 1)
ANIMAL SYSTEMATICS (L2+T0+P2) 32 HOURS

Unit I: Definitions and Concepts 08 Hours
a) Importance of Systematics and its History
b) Vertical and Horizontal classification
c) ICZN- Origin of the code and rules governing Nomenclature
d) New Trends in taxonomy- Chemotaxonomy, Cytotaxonomy and Molecular Taxonomy

Unit II: Procedures in Taxonomy 08 Hours
a) Collection, Preservation, Cataloguing and Curating
b) Types of identification keys
c) Cladistic, evolutionary and Phenetic classification
d) Biometric Techniques

Unit III: Concept of Species 08 Hours
a) Concept of Species- Limitations, Origin of higher Categories.
b) Species concepts- varieties, sub species, sibling species, race
c) Speciation- Isolating mechanisms- Allopatric, Peripatric, Parapatric and Sympatric Species
d) Causes of Speciation- Chromosomal, Hybrid and Symbiotic. Adaptive radiation

Unit IV: Taxonomy of Fishes and Ants as representative groups 08 Hours
a) Classification of fishes- up to orders with an emphasis on Indian species
b) Biocode – Comparison with existing code
c) Classification of insects. Major orders and their characteristics.
d) Detailed classification of formicidae

Animal Systematics Practicals: 64 Hours
1) Construction of Dichotomous key by using comparative feature of organism using museum specimens. 4x 2 = 08
2) Use of character to build phenogram 4x 2 = 08
3) Use of character to build cladogram 4x 2 = 08
4) Identification of fresh water fish- any one family 4x 2 = 08
5) Identification of marine fish- any one family 4x 2 = 08
6) Use of taxonomic keys- Dichotomous keys 4x 3 = 12
7) Identification of major formicidae group of insects- (classification of any ten ant species) 4x 3 = 12
8) Field trip for Entomological collection – two locally available insect species.

References:


**I Semester**

**AZ 1.2 (Hard Core - 2)**

**ANIMAL PHYSIOLOGY (L2+T0+P2) 32 Hours**

**Unit I:** Respiration 8 Hours

- a) Contrast between aquatic and terrestrial respiration
- b) Special features of respiration in insects and birds
- c) Regulation of respiration and transport of respiratory gases.
- d) Cellular respiration: Glycolysis, Krebs cycle, ET System and energy budget

**Unit II:** Physiology of osmoregulation and excretion 8 Hours

- a) Salt and water balance in tissues
- b) Osmoregulation in aquatic, amphibious and terrestrial animals and their control mechanisms
- c) Patterns in Nitrogen excretion
- d) Physiology of nephron in formation of Urine and Regulation of renal activity

**Unit III:** Physiological Ecology 8 Hours

- a) Various environmental variables
- b) Concept of homeostasis, acclimation and acclimatization
- c) Adaptations to temperature variations: endothermy and ectothermy
- d) Heat shock proteins

**Unit IV:** Neuro and Muscle Physiology 8 Hours

- a) Ionic basis of resting membrane potential
- b) Generation and conduction of action potential
- c) Neuro transmission
- d) Mechanism of muscle contraction with emphasis on sliding filament theory

**Animal Physiology Practicals:** 64 Hours

1. Estimation of liver and muscle glycogen (Slaughter house sample) 4x 2 = 08
2. Detection of amylase activity on starch (slaughter house samples) 4x 2 = 08
3. Detection of protease activity on proteins 4x 2 = 08
4. Detection of lipase activity on lipids 4x 2 = 08
5. Estimation of glucose 4x 2 = 08
6. Detection of excretory and pathological constituents in urine 4x 2 = 08
7. Determination of Respiratory Quotient in fish 4x 2 = 08
8. Active transport in Malphigian tubules in insects 4x 2 = 08

**References**

10. Shepherd G M. Neurobiology –Principles of Neurol science, E. Kandel and P Schwart

I Semester
A Z 1.3 (Hard Core 3)
CELL AND MOLECULAR BIOLOGY (L2 +T0+P2) 32 Hours

Unit I:- Overview of animal cell and cell organelles. 8 Hours
1.1 Membrane composition, structural arrangement and function - structure of membrane, lipid bilayer, Fluid Mosaic model.
1.2 membrane proteins, diffusion, osmosis, passive transport, active transport, uniport, symport, antiport, membrane pumps, mechanism of sorting and regulation of intracellular transport.
1.3 Structure and Functions of microfilaments, microtubules and their role.

Unit II:- Cell Division and Cell Signaling 8 Hours
2.1 Cell junctions, extra cellular matrix, matrix biomolecules, cell matrix interactions, cell to cell interactions, cell adhesion junction- tight junction, gap junction, plasmadesmata
2.2 Cell division and cell cycle - phases of cell cycle, checkpoints of cell cycle, Cyclins and Cyclin dependant kinases, regulation of cell cycle, mitosis, meiosis.
2.3 Cell signaling - hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, Receptor protein- tyrosin kinase and ion chanel receptors.
2.4 Signal transduction pathways, primary and secondary messenger systems, regulation of signaling pathways.

Unit 3:- Cancer Biology 8 Hours
3.2 Apoptosis, Ageing, Programmed cell death, Caspases, regulation of apoptosis, intrinsic and extrinsic regulation, genetic control of apoptosis.

Unit 4:- DNA replication and repair mechanism 8 Hours
4.1 DNA replication – Types of replication. molecular mechanisms of DNA replication, regulation of replication.

Cell and Molecular Biology Practicals:- 64 Hours
1) Preparation of fixatives and Stains for chromosome study (Hematoxylin & Aceto Orcin, Aceto Caramin, Giemsa) 4x 1 = 4
2) Study of Mitotic stages using plant materials 4x 1 = 4
3) Study of Meiotic chromosomes of Grasshopper testis permanent slides. 4x 2 = 8
4) Preparation of Meiotic chromosomes using grasshoppers testis squash 4x 2 = 8
5) Calculation of Chiasmata frequency by Diakinesis score 4x 2 = 8
6) Observation of polytene chromosomes of Drosophila melanogaster 4x 2 = 8
7) Preparation of Human Karyotype using metaphase plate (Normal) 4x 2 = 8
8) Preparation of Human Karyotype using metaphase plate (abnormal) 4x 2 = 8
9) Study of sex chromatin (Barr body/drum stick) through preparation of buccal smear/ blood smear. 4x 2 = 8

References
8) Atherly A G and J R Mc Donald 2006. The Science Of Genetics, saunders college Publishing,Harcourt Brace College Publisher

I Semester
AZ 1.4 (Soft Core - 1)
WILDLIFE BIOLOGY & CONSERVATION (L3+T1+P0) 48 Hours

Unit I:- Techniques- Capturing and Tracking Wildlife Population 12 Hours
a) Techniques for capturing wildlife: Capturing devices – entrapment, drugs and electrofishing
b) Handing, Marketing, Tagging and Banding techniques.
c) Methods of documenting wildlife – Radiotelemetry, still and video-photography
d) Estimation of wildlife population
e) Demographic studies, genetic bottle necks, population viability analysis
f) Territory mapping, line transect, capture-recapture, pellet count, call/tract count removal methods

Unit II: Wildlife Depletion 12 Hours
a) IUCN Red list criterions and categories - Endangered, Critically endangered, Vulnerable, Extinct.
b) Loss of wildlife: Reasons - Human interaction habitat destruction, fragmentation, Degradation. Alien species introduction and Over-exploitation
c) Important wildlife Diseases and their control.

Unit III: Wildlife Management Strategies 12 Hours
a) Identification of priority areas in conservation research
b) Habitat management and establishment of wildlife corridors
c) In-situ conservation - establishment of protected areas, National parks, Sanctuaries, and Biosphere reserves.
e) ex-situ conservation - captive breeding and repopulation programme - role of Zoo’s, botanical gardens and Aquaria

Unit IV: Conservation efforts and legal aspects 12 Hours
a) National and international conventions concerned with wildlife conservation: CITES, TRAFFIC
b) Important Indian fauna and their distribution - Lion, Tiger, Rhino, Deer, Wild buffalo, Crocodile, Great Indian bustard, etc.
d) Other measures for conservation of biodiversity and sustainable use of its components.

References:
I Semester
AZ 1.5 (Soft Core - 2)
EVOLUTIONARY BIOLOGY (L3+T1+P0) 48 Hours

Unit I: Introduction to evolutionary theories 12 Hours
  a) Nature of evolution: Neodarwinism and Neolamarkism, Basic forces of evolution- Hardy Weinberg Equilibrium, Selective forces.

Unit II: Population genetics and evolution 12 Hours
  a) The expression of variation: Population genetics and evolution, quantitative traits and genetic variation, methods for analyzing patterns of gene expression.
  b) Developmental pattern genes, seasonal polyphenism in butterflies, adaptive plasticity.

Unit III: Selection and speciation 12 Hours
  a) Sexual selection and speciation: Sexual selection and its origin, competition for mates, Mate choice, Evidence for sexual selection, Sperm competition and choice by eggs.

Unit IV: Molecular evolution 12 Hours
  a) Molecular evolution: Phylogeny, cladistics, Molecular data and homoplasy theory and rationale of tree building. The geneology og genes and the phylogeny of species.

References
5. Lull, Organic Evolution.
Unit- I Introduction to statistical methods
   a) Definition and scope of statistical methods in biological studies.
   b) Descriptive statistics- Population and sample collection of data- tabular and
      graphical representation of data- attributes and variables- discrete and continuous
      variables.
   c) Frequency distribution- preparation of frequency table- relative and cumulative
      frequencies. Diagrammatic representation of frequency distribution-
histogram,polygon,frequency curves and ogives
   d) Measures of central tendency and dispersion/scales and skewness
   e) Linear correlation and regression- Spearman’s rank correlation

Unit-II Sampling methods in statistics
   a) Elementary idea of probability- introduction, Defination, Concepts of probability-
classical and empirical relative frequency of probability, addition and multiplication
   theories.
   b) Binomial, poison and normal distribution properties
   c) Elementary sampling theory- sampling theory, random sample, random numbers ,
sampling distribution, standard errors

Unit-III Significance tests
   a) Tests of significance- normal student ‘t ‘ test, chi-square, F-tests, tests of hypothesis
      about population, mean and variance of normal population- level of significance
   b) Analysis of variance. Assumption, one way classification with equal numbers of
      observations per cell multiple comparision- tests for normality and homogeneity of
      variances, CRD and RBD.

References:
4) Gerstman B B (2008) Basic Biostatistics Jones and Bertlett Publisher Singapore

II Semester
AZ 2.1 (Hard Core - 4)
AQUACULTURE & FISHERY TECHNOLOGY (L2+T0+P2) 32 Hours
Unit I:- Aquaculture Practice in India
   a) Scope and importance of aquaculture. Common cultivable species and their
      distribution
   b) Prawn culture- common cultivable species (Penaeusmonodon, P. indicus,
      Macrobrachium rosenbergii), their distribution. Traditional prawn filtration. New
      technology for prawn culture, seed production- eye stalk ablation. Common diseases.
   c) Mussel culture- muscle culture :seed production- natural collection and artificial
      production. Different culture methods, harvesting and processing.
   d) Pearl culture- Types of pearls and culture techniques, preparation of nuclei, host
      implantation, rearing and harvesting.

Unit II:- Introduction to Fish culture 8 Hours
a) Historical background, role and scope of pisciculture. Present scenario of fisheries.
fishes as a food commodity
b) Culture or fresh water fish: types of fish ponds pond maintenance and improvement- liming, manuring (organic and inorganic fertilizers), feeding.
c) Factors effecting fish culture- physical, chemical, and biological factors.

Unit III: Fish Processing Technology 8 Hours
b) Fish preservation and processing – Chilling, freezing, freeze drying, salting, smoking and canning.
c) Fish by products- fish meal, fish oil, fish protein concentrate, isinglass, fish manure, fin rays, chitin, chitosan, biochemical and pharmaceutical compounds.
d) Fish diseases- Bacterial, viral, fungal and other pathogens of fishes.

Unit IV: Fish Dynamics 8 Hours
b) Fecundity, mortality, survival rates of fishes.
c) Fish production and its measurement. Density and abundance, their fluctuations.
d) Study of aquatic pollution with reference to fisheries.

Practicals: 64 Hours
1. Field visit to various fish farms in and around Mysore for getting hands on experience for pisciculture practices. 4x2 = 08
2. Visit to fish processing industries to know fish processing and by products. 4x2 = 08
3. Aquarium: Design, equipments and execution of aquarium. 4x2 = 08
4. Maintenance of aquarium, Ornamental fishes. 4x2 = 08
5. Morphometric measurements of locally available fresh water fish and marine fish 4x2 = 08
6. Identification of fish based on their morphology. 4x1 = 04
7. Identification of prawn and mussels. 4x1 = 04
8. Water quality analysis and its relation with fisheries – pH, Dissolved oxygen, Total alkalinity, Salinity, Calcium, Magnesium, Nitrites, Phosphates, total dissolved solids, Suspended solids, Turbidity. 4x4 = 16

References:
1. Kurein and Sebastain: Prawn and Prawn Fisheries in India.
2. Sing VPP and Ramachandran : Fresh Water Culture ; IACR, New Delhi,
3. Tripathi SD: Technique of Composite Fish Culture; IIT Karaghpur.
4. Govindan T K : Fish processing technology ; Oxford and IBH.
6. Alikunhi : Fish Culture in India.

II Semester
Unit 1: Mendelian Genetics – 8 Hours
1.1 Mendelian inheritance - mono/dihybrid cross, laws of heredity, types of dominance, multiple allelism.
1.2 Extensions of Mendelian principles - co-dominance, incomplete dominance, gene interactions, linkage and crossing over, sex linkage, sex limited and sex influenced characters.
1.3 Quantitative Genetics - polygenic traits and mode of inheritance, genetic and environmental factors, heritability, inbreeding and consequences, coefficient of inbreeding and consanguinity.
1.4 Mutation - types, causes and detection, mutant types- lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, Molecular Mechanism of mutation, transision and transversion . chemical mutagens: base analogues, alkylating agents, nitrous acid, dyes. Radiation mutations.

Unit II: Human Genetics – 8 Hours
2.1 Mobile DNA elements – transposable elements, AC, Ds elements in maize. IS elements, P elements, retroviruses, retrotansposons. Molecular mechanism of transposition.
2.2 Structural and numerical alterations of chromosomes - deletion, duplication, inversion, transversion, translocation, ploidy and their genetic implications.
2.3 Extra chromosomal inheritance - cytoplasmic inheritance, inheritance of mitochondrial genes, maternal inheritance.
2.3 Human genetics- pedigree analysis, some important human genetic diseases, karyotypes, genetic disorders and syndromes (Phenylketonuria, Lesch-Nyhan syndrome, Tay-Sachs disease, Alkaptonuria, Albinism, Congenital adrenal hyperplasia, Emphysema, Glucose-6-phosphatedehydrogenase deficiency, Achondroplasia. Dermatoglyphics and genetic analysis.

Unit 3: Protein Synthesis – 8 Hours
3.2 Translation: Translation machinery, Genetic code, properties of triplet code.. Basal transcription apparatus, Polypeptide chain initiation, elongation and termination of translation.

Unit 4: Gene Regulation – 8 Hours
4.1 Gene regulation in prokaryotes. Negative and positive regulation, Lac operon regulation, Tryptophane operon regulation and Arabinose operon gene regulation in E coli, Lambda logic regulation in viruses.
4.2 Gene regulation in eukaryotes, Factors effecting regulation in eukaryotes. Enhancers, silencers, Gene silencing, RNA interference.

Practicals:- 64 Hours
1. Preparation of Wheat cream ager media for Drosophila culture. 4x 1= 04
2. Morphological study of Drosophila melanogaster male and female 4x 1= 04
3. Mounting the wing and sex comb of Drosophila melanogaster. 4x 1= 04
4. Mounting the genital plate of *D. melanogaster*  
5. Mounting the wing and sex comb of *Drosophila anonassae*.  
6. Mounting the genital plate of *Drosophila anonassae*.  
7. Mounting the wing and sex comb of *Drosophila bipectinata*.  
8. Mounting the genital plate of *Drosophila bipectinata*  
9. Mounting the wing and sex comb of *Drosophila malerkotliana*  
10. Mounting the genital plate of *Drosophila malerkotlyana*  
12. Genetic problems using *Drosophila*: Monohybrid and Dihybrid experiments

References:
1. Cell and Molecular Biology by De Robertis- E. D. P., I. S. E. publication.
5. Gene VI by Benjamin Lewis, Oxford press.
8. Molecular cell Biology by Darnell J. Scientific American Books USA.
12. Essentials of Molecular Biology by Freifelder D., narosa publication House.
14. The Cell: Molecular Approch by Cooper G. M.
15. Molecular Biology by Upadhay A and Upadhay K. Himalaya publication

II Semester
AZ 2.3 (Hard Core - 6)
ENVIRONMENTAL BIOLOGY (L2+T0+P2) 32 Hours

Unit I: Introduction and scope of ecology  
Environmental Microbiology  
   a. Microbial Diversity in the Environment  
   b Bioindicators in the environment  
   c. Microbial degradation of recalcitrant organic pollutants  
   d. Methods in Environmental Microbiology  
   e. Bioremediation

Unit II :- Ecotoxicology  
   a. Bioaccumulation and biomagnifications of toxicants.  
   b. Environmental toxicity of heavy metals  
   c. Environmental impact of pollutants and analysis of Dose-Effect relationship  
   d. Biopesticides and Integrated Pest Management  
   e. Modeling of Bioreactors

Unit III:-Eco-Biotechnology  
   a. Bioremediation  
   b. Bioabsorption of metals
c. Biofertilisers  
d. Biofuels and biodiesel  
e. Biopolymers and bioplastics

Unit IV: Remedial Ecology  
8 Hours  
a. Biodegradation of organic pollutants  
b. Biodegradation of pesticides in the environment  
c. Microbial transformation of heavy metals  
d. Bioleaching and Biomining for recovery of resources  
e. Microbial transformation of Pesticides

Practicals:  
1. Estimation of Dissolved Oxygen content and Biological Oxygen Demand of various water samples  4x 2= 08  
2. Estimation of Total Hardness and Chloride in different water samples  4x 2= 08  
3. Estimation of chemical Oxygen Demand of various water samples  4x 1= 04  
4. Estimation of Total Dissolved Solids and Suspended solids  4x 2= 08  
5. Estimation of Nitrate and Nitrite in water samples  4x 1= 04  
6. Estimation of Phosphate in various water samples  4x 2= 08  
7. Estimation of Sulphate in water samples  4x 2= 08  
8. Estimation of turbidity of water  4x 2= 08  
9. Study of planktons in the water samples.  4x 2= 08

References  

II Semester  
AZ 2.2 (Soft Core - 5)  
APICULTURE & VERMICULTURE (L3+T1+P02)  48 Hours  
A-APICULTURE

Unit- I:- Apiculture Biology  
12 Hours  
a. History, scope and importance of apiculture  
b. Classification of honeybees with special reference to Indian species  
c. Morphology and structural adaptations of honey bees  
d. Bee plants, pollen calender, collection of propolis and water  
e. Social organization, division of labour, comb building, communication in honeybees.
a. Beekeeping- rearing equipments, honey bee species employed in rearing, queen
rearing, bee nursing, seasonal management, migratory beekeeping.
b. Flora and seasonal management
c. Bee hive products- Honey and Wax extraction
d. Honey- Chemical composition, medicinal importance and apitherapy
e. Honey bee diseases, pests and predators and their control.
f. Economics of apiculture.

VERMICULTURE

Unit-III : Vermiculture and earthworm biology 12 Hours
a. History, scope and importance of vermiculture.
b. Earthworm species and their role in vermiculture.
c. Organic wastes- sources and their use
d. Present status of vermiculture at global and national level.
e. Vermiculture technology- Equipments, raw materials and steps involved in
compost preparation
f. Preparation of vermiculture pit- types of tanks

Unit- IV:- Management of vermi compost unit 12 Hours
a. Management of verminary Unit- diseases, predators and their control.
b. Management during different seasons
c. Vermicompost- Vermicast and Vermiwash and their chemical composition
d. Field applications of vermicompost
e. Economics of vermiculture

Practicals:- 64 Hours
1) Morphological study of different castes of honeybee colony. 4x 2= 08
2) Study of honeybee species 4x 2= 08
3) Mounting of mouth parts, pollen basket and stinging apparatus 4x 2= 08
4) Testing for adulteration of honey 4x 2= 08
5) Spectrophotometer analysis of honey for its quality 4x 2= 08
6) Study of honeybee flora- nectar and pollen plants 4x 1= 04
7) Pest, predators, enemies of honey bees 4x 1= 04
8) Morphological study of earthworms 4x 1= 04
9) Analysis of solid waste for earthworm culture. 4x 2= 08
10) Pests, predators and enemies of earthworms. 4x 1= 04

References:-
   Bikaner, India.
3) Singh S (1962). Beekeeping in India. ICAR, New Delhi, India.
   York.
II Semester
AZ 2.5 (Soft Core- 5)
ENDOCRINOLOGY (L3+T1+P0) 48 HOURS

Unit I:  12 Hours
a) Hormones: chemical messengers: Autocrine, Paracrine and endocrine secretions, Types of hormones, an overview of human endocrine system
b) Role of Hormones in homeostasis-Glucose and water balances
c) Neuro-endocrine integration; Milk ejection reflex
d) Methods in endocrinology studies- Principal and application of Histology and cytology, Bioassay , RIA, Immunohisto-chemistry, ELISA

Unit II  12 Hours
a. Hormone synthesis-molecular aspects of peptide and steroid hormone, biogenic amine synthesis.
b. Mechanism of hormone action: Regulation of receptor numbers, second messengers concept-cAMP,DAG,IP3 ,prostaglandins and calmodulin, RTK, Genomic action –regulation of gene expression.
c. Termination of hormone action and metabolism of hormones.

Unit III  12 Hours
b) Pineal- Morphology and physiological actions of melatonin

Unit IV  12 Hours
a) Structure and biosynthesis and actions of hormones of Thyroid, parathyroid and adrenal gland
b) Gastro intestinal hormones
c) Endocrine pancreas- Structure and secretions of hormones. Mechanisms of action of insulin. Diabetes mellitus-Types, symptoms, diagnosis and management

Reference

**II Semester**
**AZ 2.6 (Soft Core- 6)**
**ANIMAL BEHAVIOR (L3+T1+P0) 48Hours**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I: Descriptive versus experimental approaches</td>
<td>12</td>
</tr>
<tr>
<td>Reflexes and complex behaviour- Latency, after discharge, summation, warm up, fatigue inhibition and feedback control</td>
<td></td>
</tr>
<tr>
<td>Instinctive Behaviour- Fixed action pattern, Types of sign stimuli and releasers as triggers, Genetic basis of instinctive behavior.</td>
<td></td>
</tr>
<tr>
<td>II: Learning - Classical conditioning experiment, latent and insight learning. Social learning, learning sets and play.</td>
<td>12</td>
</tr>
<tr>
<td>Development of behavior- Causes of behavioural changes during development, development of bird song.</td>
<td></td>
</tr>
<tr>
<td>Importance of early experience- critical period- Filial imprinting, Sexual imprinting in birds, Imprinting like process in mammals.</td>
<td></td>
</tr>
<tr>
<td>III: Foraging and anti-predator behavior: Anti-predator- avoiding detection through colour and markings (Mullerian mimicry); Warning colouration; Batesian mimicry</td>
<td>12</td>
</tr>
<tr>
<td>Biological communication: Forms of signals, vision, audition and chemicals</td>
<td></td>
</tr>
<tr>
<td>IV: Sexual Behavior</td>
<td>12</td>
</tr>
<tr>
<td>Hormones and sexual behavior- Selected examples of courtship and mating behavior.</td>
<td></td>
</tr>
<tr>
<td>Pheromones in Insects and Mammals; Lee Boot, Whitten, Bruce, Collidge and Castro-Vandenbargh effects; Selected examples of courtship and mating behavior; Social organization: Introduction, Advantages of grouping; Social organization in insects with special reference to ants and honeybees; Social organization in sub human primates</td>
<td></td>
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<tr>
<td>Altruism</td>
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</tbody>
</table>

**References**

**II Semester**
**AZ 2.7 (Open Elective 1.1)**
**PARASITOLOGY (L3+T1+P0) 48Hours**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I: a) Definition and types of parasites, Significance, General properties of parasites and parasitic environment like alimentary canal, Blood, Lymph and tissues, etc.</td>
<td>12</td>
</tr>
<tr>
<td>b) Morphology, Mode of infection, disease caused , Symptoms and Preventing measures of following parasites, Trypanosoma, Plasmodium, Balantidium and Entamoeba histolytica</td>
<td></td>
</tr>
</tbody>
</table>
Unit II: Helminthes  
12 Hours
a) Morphology, mode of infection, disease caused, Symptoms and preventive measures of
  Tape worm, Liver fluke, *Ascaris* and Filarial worm.
b) Ectoparasites: Morphology and Behaviours of Ticks, Mites, Bedbugs, Headlouse and
  Mosquitoes

Unit III: Parasitic Adaptations  
12 Hours
a) Parasitic adaptations in *Plasmodium, Entamoeba hystolitica*, Tapeworm, Hook worm,
  *Ascaris*, Liver fluke, Filarial worm, Mosquitoes and Leech.

Unit IV: Immuno-Parasitology  
12 Hours
a) Immunity against parasites, Parasitic antigen, Antiparasitic responses, Evasion of
  immUnity, vaccination and diagnosis.

Reference
   International Tokyo

II Semester
AZ 2.8 (Open Elective 1.2)
ORNITHOLOGY (L3+T1+P0) 48 Hours

Unit I: Introduction  
12 Hours
a. Origin of birds- Theropod and Dinosaur Hypothesis
b. Specialized adaptive features, respiration, digestive system, food habits, vision.
c. Birds of Karnataka,
d. Important migratory birds of India.

Unit II: Biogeography of Birds  
12 Hours
a) Birds of India
b) Habitats
c) Economic importance of birds- useful and harmful agriculture birds.

Unit III: Feathers and Flight  
12 Hours
a) Structure of feathers, types of feathers, Adaptation for flight
b) Migration and navigation, bird ringing, radio telemetry in ornithology

Unit IV: Birds Behavior  
12 Hours
a) Territorial and colonial behavior
b) Communication in birds
c) Reproductive behavior, mating, nests, eggs pre and post fertilization, incubation,
  hatching and parental care.

Tutorials:
1. Identifying local birds
2. Recording feeding habits.

Reference

III Semester
A.Z 3.1 (Hard Core - 7)
ANIMAL HUSBANDRY (L3+T0+P2) 48 Hours
Unit I: Poultry

a) History and scope of poultry Science
b) Classification and systematic position of poultry birds
c) Commercially important breeds of poultry, Turkeys and Ducks.
d) Poultry breeding: Principles, Techniques and methods
e) Poultry farming, types of farm houses and equipments
f) Hatcheries and its importance
g) Growers, layers and Broilers ration in poultry farming.
h) Poultry feed; raw materials, feed/ration manufacture, nutritional requirements of breeding chicks, broilers and layers
i) Poultry management, diseases and their control and vaccination.
j) Poultry products: egg, meat and other by-products and their economic Importance
k) Nutritional value of egg and meat.

Unit II: Diary farming

a) History, scope and importance of Diary farming.
b) Dairy breeds: Exotic and indigenous cattle breeds
c) Buffalo breeds: Swamp and Riverine buffaloes
d) Breeding programs: Methods of breeding and Artificial Insemination
e) Nutritional requirements of dairy animals
f) Fodder and Feeds

Unit III: Dairy Management

a) Dairy management: Housing, care of calf, cow and bull
b) Microbial and parasitic diseases and their control and vaccination
c) Milk: Physico-chemical and biological properties of cow and buffalo milk, nutritional value.
d) Processing, preservation and marketing of milk
e) Milk products and their economic importance

Unit IV: Sheep, Pig and rabbit farming

a) Sheep farming: Breeds/races used in sheep farm.
b) Sheep rearing techniques, Food and Fodder and its economics.
c) Piggery: Rearing of pigs and meat production.
d) Economics of piggery
e) Rabbit culture: Rearing, management of Rabbit culture during different seasons
f) Economics of Rabbit culture.

Practicals: 64 Hours

1. Morphological features of broilers, layers and breeders. 4x 1= 04
2. Quality parameters of chick egg. 4x 1= 04
3. Incubation of chick egg and candling of egg. 4x 2= 08
4. Estimation of protein, carbohydrate and lipid contents in chick egg. 4x 3= 12
5. Estimation of protein, carbohydrate and lipid contents in chicken meat. 4x 3= 12
6. Estimation of protein in milk. 4x 1= 04
7. Estimation of Fat in milk. 4x 1= 04
8. Tests for adulteration of milk products.  

Reference

III Semester
A.Z 3.2 (Hard Core - 8)

ANIMAL BIOTECHNOLOGY (L2+T0+P2) 32 Hours

Unit-I: Introduction to Animal Biotechnology 8 Hours
a) Introduction to Animal Biotechnology - Animal models, alternatives to animal models. Regulation of animal research, clinical trials.
b) Cell/tissue culture - requirements and techniques of animal cell culture, tissue culture, organ culture, Hybridoma technology, tissue engineering
c) Stem cells - types and sources of stem cells, stem cell cloning - embryonic and adult stem cells - potential of stem cell therapy.

Unit-II: Genetic Engineering 8 Hours
a) Genetic engineering - concepts of recombinant DNA technology and scope, basic methodology - DNA modifying enzymes, vectors - viral, bacterial, cloning and expression of vectors, DNA transformation, methods of screening recombinant DNA
b) Construction of cDNA and gene libraries - methods of labeling DNA, nick translation, random priming

Unit-III: Cloning 8 Hours
b) PCR technique - methods of DNA replication, PCR based mutations, types of PCR. Blotting techniques - Southern, Northern and Western blotting - DNA finger printing techniques and application - Artificial chromosomes - BAC, YAC, HAC.

Unit-IV: Transgenic animals, Bio safety & bioethics 8 Hours
a) Production and use of transgenic animals - methods of production of transgenic animals (with suitable examples). Transgenic animals - Biopharming - use of transgenic animals in life stock. Pharmaceuticals, therapeutic proteins

b) Nano biotechnology - introduction, scope and importance.

c) Bioethics and bio safety

**Practical;**

1) Isolation of genomic DNA rapid method using plant material. 4x 2= 08
2) Isolation of genomic DNA by chloroform phenol method using animal cell (Blood cells) 4x 2= 08
3) Agarose gel electrophoresis of DNA 4x 2= 08
4) PAGE for proteins/enzymes 4x 2= 08
5) Estimation of DNA by Diphenylamine method 4x 2= 08
6) Estimation of RNA by Orcinol method 4x 2= 08
7) Isolation of cloning vector 4x 2= 08
8) Restriction digestion 4x 1= 04
9) DNA ligation 4x 1= 04

**Reference**


**III Semester**

A.Z 3.3 (Hard Core - 9)

**IMMUNOLOGY & TOXICOLOGY (L2+T0+P2)** 32 Hours

**Immunology:**

**Unit 1 Fundamentals of Immunology** 8 Hours

1.1. History, development and scope of immunology
1.2. Immunity-classification-innate, acquired, active and passive immunity
1.3. Lymphoid organs-Primary and secondary lymphoid organs
1.4. Antigens and antibodies
1.5. Immune responses-Primary and secondary immune, humoral and cell mediated responses
1.6. The compliment system-Classical and alternative pathways

**Unit II- Cells of Immunity** 8 Hours

2.1. Major histocompatibility complex-MHC antigens, HLA Functions of MHC
2.2. Hypersensitivity-Types, prevention and treatment
2.3. Tumor immunology
2.4. Immunology of transplantation
2.5. Autoimmune diseases
2.6. Immunological techniques

**Toxicology**

**Unit III:- Essentials of toxicology** 8 Hours

3.1. Definition, Scope of toxicology – Major subdivisions of toxicology
3.2. Factors influencing toxicity – Dosage, Route of exposure -species and strain differences , sex, age, environmental conditions.
3.3 .Toxicological evaluation, selection of test organisms – Acute and chronic toxicity tests. Nonacute toxicity tests.
3.4. Ecotoxicology and Environmental alteration of toxic substance, Biomagnifications,
3.5 Bioaccumulation and Bio-magnification
3.6 Variability of responses by biological systems.

Unit IV: Sources and cellular mechanism in Toxicology 8 Hours
4.1 Toxicity of pesticides and heavy metals, mode of exposure and their action.
4.2 Sources and mode of action of plant toxins, Mycotoxins, microbial toxins.
4.3 Metabolism, detoxification and excretion of toxic substances: Primary processes, conjugation systems.
4.4 Tissue specific toxicity, hepato-cardiac, and renal toxicity,
4.5 Genotoxicity.
4.6 Treatment of toxicity – Principles of antidotal therapy.

Practicals: 64 Hours
1. The concept of Blood grouping 4x 2= 08
2. Estimation of Total number of RBC count By Hemocytometer 4x 2= 08
3. Estimation of Total number of Leukocyte (WBC) Count By Hemocytometer 4x 2= 08
4. Differential counting of leucocytes by blood smear technique method. 4x 2= 08
5. Preparation and identification of hematin crystal in blood. 4x 1= 04
6. Bioassay by using chemicals on insect larvae. 4x 2= 08
7. Different extraction methods for plant Or Different techniques for plant extraction 4x 2= 08
8. Bioassay by using medicinal plants on insect larvae. 4x 2= 08
9. Evaluating lethal concentrations/dose by using Probit analysis software. 4x 1= 04

Reference:
1. Dulsy Fathima and Armugam N (2007) Immunoloy, Saras publication, Nagercoil

III Semester
AZ 3.4 (Soft Core - 7)
REPRODUCTIVE BIOLOGY (L3+T1+P0) 48 Hours

Unit-I: FEMALE REPRODUCTION 12 Hours
a) Genetic and hormonal control of sex differentiation in mammal
b) Mammalian ovary – Functional morphology : Hormonal control of follicular development – Recruitment and selection of follicles and follicular dominance
c) Ovulation, Atresia, Regulation of corpus luteum
d) Hormonal control of female reproductive organs

Unit-II: REPRODUCTIVE CYCLES IN MAMMALS 12 Hours.
a. Over view-estrous and menstrual cycles
b. Onset of puberty in human being, Hormonal control of menstrual cycle
c. Implantation- Types and hormonal control
d. Pregnancy- Gestation, hormonal control of gestation
e. Parturition- Hormonal control
f. Lactation- Hormonal control of mammary gland development and lactogenesis

Unit- III : MALE REPRODUCTION 12 Hours
a. Functional morphology of mammalian testis
b. Kinetics of spermatogenesis – wave and cycle
c. Hormonal control of spermatogenesis
d. Brief description of histomorphology and hormonal control of male accessory organs viz., epididymis, vas deferens, seminal vesicles, ventral prostrate, bulbourethral gland and preputial gland
e. Sperm maturation – morphological and biochemical events, influence of accessory organ secretions
f. Ultrastructure of spermatozoa
g. Abnormalities of sperm
h. Biochemistry of semen and capacitation

Unit- IV : FERTILITY CONTROL AND INVITRO FERTILIZATION 12 Hours
b. Termination of gestation
c. Gamete specific antigens, antibody mediated fertilization block
d. In vitro fertilization

Reference

15. tchinson, University Library, London.

**III Semester**

**AZ. 3.5 (Soft Core - 8)**

**SERICULTURE (L3+T1+P0)**

**48 Hours**

**Unit- I** Introduction to silkworm biology 12 Hours

a. Introduction to sericulture- Origin and history of sericulture- scope of sericulture Silk Road.
b. Mulberry and Non mulberry silk worms- complete metamorphosis endocrine control of metamorphosis
c. Silkworm rearing- rearing equipments- incubation of silkworm eggs mulberry leaves for silkworms- environmental factors for silkworm rearing

**Unit- II** Silk worm egg production 12 Hours

a. Silkworm egg production- Grainages- mother moth examination- oviposition- acid treatment
b. Silkworm seed organization- seed areas
c. Silkworm races/breeds- classification- univoltine races, bivoltine and multivoltine
d. Pests and diseases of silkworms and their management- Pebrine, Grasserie, Flacherie and Viral diseases- Uzifly and their management

**Unit-III** Commercial charactes of cocoons 12 Hours

a. Physical and commercial characteristics of cocoons- cocoon sorting- cocoon stifling-cocoon cooking.
b. Cocoon reeling- different methods of reeling- reeling water, re-reeling.
c. Raw silk properties- Testing of silk fibers
d. Silk exchange, weaving and dyeing of silk.
Unit-IV By products of silkworm industry  
12 Hours 
   a. By products of sericulture industries and their utilization- spun silk, silk wastes  
   b. A brief account of sericulture biotechnology- utilization of larva, pupa and raw silk  
      in seri- biotechnology  
   c. Employment generation from sericulture- industry  
   d. Extension and sericulture 

Reference 

III Semester  
AZ 3.6 (Open Elective 3.1) 
BASICS OF ZOOLOGY (L3:T1:P0)  
48 Hours 

Unit: 1 Cell structure  
12 Hours 
   a. Structure of animal cell.  
   b. Structure and function of Plasma membrane, Mitochondrion, Endoplasmic reticulum.  
   c. Structure and function of Gogli complex, Ribosomes Lysosomes and Nucleus.  
   d. Morphology and types of chromosomes.

Unit: 2 protozoa to cnidaria  
12 Hours 
   b. General characters and classification of Protozoa upto classes with examples.  
   c. General characters and classification of Porifera upto classes with examples.  
   d. General characters and classification of Coelenterata upto classes with examples.

Unit; 3:- Helminthes  
12 Hours 
   a. General characters and classification of Platyhelminthes upto classes with examples.  
   b. General characters and classification of Aschelminthes upto classes with examples.  
   c. General characters and classification of Annelida upto classes with examples.  
   d. General characters and classification of Arthropoda upto classes with examples.

Unit: 4:- Chordata  
12 Hours 
   a. General characters and classification of Mollusca upto classes with examples.  
   b. General characters and classification of Echinodermata upto classes with examples.  
   c. General characters and classification of Chordata upto subphyla with examples.  
   d. General characters and classification of Vertebrata upto classes with examples.

References:  
1. Ekambaranth Iyer, Invertebrate Zoology  
2. Ekambaranth Iyer, Vertebrate Zoology
3. Verma and Jordon, Invertebrate Zoology, Himalaya Publication
5. Parker and Haswell, Invertebrate Biology,

**III Semester**

**AZ 3.7 (Open Elective 3.2)**

**SERICULTURE TECHNOLOGY (L3+T1+P0)**

**48 Hours**

**Unit I**  
12 Hours

a. Classification of sericigenous insects, characteristics features of the order Lepidoptera, detailed study of families - saturnidae and Bombycidae – life Cycle of Bombyxmori, life cycle of non mulberry silkworms metamorphoses.

b. Classification of silkworm based on moultinism, voltinism and Geographical distribution - popular silkworms breeds and hybrids in India.

c. Morphology and Anatomy of silk gland and reproductive system.

**Unit II**  
12 Hours


b. Silkworm seed organisation and its significance – seed area – Grainage operations – egg preparation – Hibernating and non hibernating eggs – mother moth examination.

**Unit III**  
12 Hours


b. Silk reeling technology – cocoon marketing – cocoon cooking – cocoon reeling – Re reeling and packing – quality of water for reeling

**Unit IV**  
12 Hours

a. Seri Biotechnology – By products of sericulture industry – silkworm as a bioreactor for the production of antibacterial proteins – Baculovirus vectors in silkworm

b. Utilization of pupa for the production of madinally important fungal strains – utilization of silk for the production cosmetics material. Transgenic silkworm – molecular mechanism of silk protein synthesis

**Reference**


**IV Semester**

**AZ 4.1 (Hard Core -11)**

**BIODIVERSITY (L2+T0+P2)**

**32 Hours**
Unit- 1 BIODIVERSITY CONCEPTS: 8 Hours

Genetic Diversity, Species diversity, Ecosystem diversity. Importance of Biodiversity.
Biodiversity from a taxonomic and Evolutionary perspective.
Uniqueness of Indian Wildlife
Endemism and Biodiversity

Unit-II BIODIVERSITY AND ECOSYSTEM FUNCTIONING 8 Hours

Ecosystem development – Trophic levels, Energy nutrient relationships, Biotic succession, Ecotone and Edge.
Keystone Species and Species interactions – Competition and community Organization
Zoogeographical regions of the World
Biodiversity hotspots

Unit- III WIDL LIFE HABITATS AND RELATED ASPECTS 8 Hours

Biome essays- Arctic and Alpine systems, tropical and temperate forests, boreal forests, Tundra, Coastal ecosystems, coral reefs, Mangrove system, Esturian system, Lakes and rivers, caves, mountains and deserts
Concept of Niche, Territory and Home range
Sources of Information – Botanic Garden, Zoo- garden, Aquaria
Gene Bank and sequence Data Bank

Unit- IV: BIODIVERSITY ASSESSMENT: 8 Hours

Diversity Index (Shannon- Weaver) and Dominance Index (Berger- Parker and Simpson)
Species heterogeneity Index and Species richness Index
Evenness Index, Breadth of Utilization and Jaccard Index
Sequential Comparison Index and Goodnight and Whitley’s Index.

Practicals: 64 Hours

1. Estimation of Biodiversity on a following transect and quadrate method. 4x 2 = 08
2. Study of Avian diversity in agricultural area/undisturbed area/Mountain area. 4x 2 = 08
3. Study of insect diversity on a insect in agricultural field/undisturbed area/wild. 4x 2 = 08
4. Study of wildlife and birds in a National park/Sanctuary/Zoo/Western Ghats. 4x 2 = 08
5. Study of Ichthyofauna in local market/along the plane/forest zone. 4x 2 = 08
6. Study of Butterfly diversity along the campus/city 4x 3 = 12
7. Study of Ants diversity in field ecosystem. 4x 3 = 12
8. Visit to various National Research Institutes of Zoological importance /Animal Breeding Centers/Fishery Research Institute.

1. Field Visit to observe and record different types of Ecosystem- Evergreen Forest, Sholes Forests, Deciduos Forest, Mangrove, Greelands.
2. Visit to Biodiversity hottest hot spot- Western Ghat.

Reference


IV Semester
AZ 4.1 (Soft Core -10)
ZOO MANAGEMENT (L2+T2+P0) 32 Hours

Unit – I 8Hours
Design of Zoos – Types of Zoos – Large, Medium and Small, Housing of Animals in the zoos, Types of enclosures, Construction and design of Zoos, Types of visitors and safety of visitors and management.

Unit-II 8 Hours
Management of animals in captivity – Management of Mammals, Birds, Reptiles, Amphibians, Fishes and Invertebrates, Butterfly parks
Animals which requires special care with one case study from each group – Birds, Marsupials, Eutherian Mammals, Primates Herbivorous and Carnivorous Mammals
Unit- III

Diseases of Zoo Animals and their control - Viral, Bacterial, Protozoan and Fungal, Veterinary parasites - Bacterial, Protozoan, Helminthes and insects. Infectious diseases of Zoo animals, their transmission and control, Vectors of zoo animals - insects and non insects. Accidents and trauma, Tranquilization. Animal food and nutrition - Nature of zoo diet, Food for herbivorous animals – composition of fresh food, artificial food, important nutrients, procurement of food. Food for carnivorous animals – composition, nutrients, procurement, Feeding methods, feeding equipments, Food contaminants, Storage and preservation of different types of food, Food Safety and hygiene.

UNIT- IV

Breeding and Management of zoo animals – Preparation of breeding plants, conservation and management of animals under the verge of extinction. Breeding and reproduction of animals in captivity, creating conditions for breeding various animals, collection and storage of sperms, Natural and Artificial insemination, care of pregnant animals and new born Collection, translocation and procurement of zoo animals, veterinary care, nutrition and feeding during collection and transportation, creation of natural environments for different animals, construction of hideouts and safety places, modern methods of feeding, nursing and maintenance of animals.

Tutorials: 16 Hours
1. Visit to Bannergatta Zoo, Shimoga (Tyavarekoppa) Lion safari.
2. Visit to Mysore Zoo: Observation of animal housing, kitchen and zoo hospital
3. One or two visits could be made to Mysore Zoo exclusively to observe the behavior of animals in the cages.

Reference:

IV Semester

AZ 4.2 (Soft Core -11)
VECTOR BIOLOGY (L3+ T1 + P0) 48 Hours

Unit- I vector born diseases 12 Hours
a. Introduction to vector borne disease and vectors- World scenario; Indian scenario.
b. Historical perspective- Epidemics, discoveries; Scientists and major events involved in the discovery of vectors and pathogens of communicable diseases  
c. Epidemiology, biology of vectors and pathogens, transmission cycles and symptoms of malaria, filariasis, yellow fever, leishmaniasis and anthrax.

Unit- II- Protozoan pathogens 12 Hours  
a. Epidemiology, biology of vectors and pathogens, transmission cycles and symptoms of dengue, chikungunya, japans encephalitis, schistosomiasis and plague. 
b. Distribution, epidemiology and control of yellow fever, African sleeping sickness, oncocerciasis and chagas disease

Unit- III Vectors 12 Hours  
a. Mechanical Vectors – House flies, cockroaches and bedbugs-life cycle & mode of infection transfer. 
b. Transmission of dysentery, diarrhea, typhoid, cholera, epidemic conjuctivity and skin infections.

Unit- IV:- Control of vector borne diseases 12 Hours  
a. Control of vector borne disease; Vector control – Chemical, Biological, Genetic and Environmental methods  

Reference  

**SC 11 & SC 12: PRJ: Major Research Project (L0+T2+ P6)**

Every M. Sc., Student has to carryout independent Major Research project during the M Sc., programme compulsorily. Major Research Project work should be initiated in the 3rd Semester and
at the end of 4th Semester after the submission of Dissertation/ major research Project report, it should be evaluated with project presentation and viva.

**Theory question paper Pattern**

<table>
<thead>
<tr>
<th>Duration 3 Hours</th>
<th>Max. Marks: 70</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. <strong>Answer all questions</strong> (Two questions from each unit)</td>
<td>2x 8 = 16 Marks</td>
</tr>
<tr>
<td>II. <strong>Answer any five of the following</strong> (Eight questions to be set with two questions in each unit)</td>
<td>6x 5 = 30 Marks</td>
</tr>
<tr>
<td>III. <strong>Answer any two of the following</strong> (One question in each unit)</td>
<td>12x 2 = 24 Marks</td>
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</tbody>
</table>

**Practical examination Pattern**

<table>
<thead>
<tr>
<th>Duration: 4 Hours</th>
<th>Max. Marks: 70</th>
</tr>
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<tbody>
<tr>
<td>I. Major experiment</td>
<td>25 Marks</td>
</tr>
<tr>
<td>II. Minor Experiment</td>
<td>20 Marks</td>
</tr>
<tr>
<td>III. Experiment/ Comment</td>
<td>15 Marks</td>
</tr>
<tr>
<td>IV. Viva</td>
<td>10 Marks</td>
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</table>