

**Choice based Credit System (CBCS)
Scheme and course structure for
M.Sc Zoology 4th semester effective from academic session 2015 and onwards**

**Marks-100
Max. (Min.)**

Course Code	Course Title	Paper Category	Hours/Week			Credits	Ext.	Int.
			L	T	P			
ZOO14401CR	Molecular Biology, Cytogenetic Core and Developmental Biology	Core	4	0	0	4	80(32)	20(8)
ZOO14402CR	Decimating & Welfare Factors And Carrying Capacity	Core	4	0	0	4	80(32)	20(8)
ZOO14403CR	Lab. Course-4 (Based on ZOO14401CR & ZOO14402CR)	Core	0	0	8	4	80(32)	20(8)
ZOO14404EA	Culture Techniques, Pathology and Fish Processing	Elective (Allied)	3	0	1	4	80(32)	20(8)
ZOO14405EA	Insect Control and IPM	Elective (Allied)	3	0	1	4	80(32)	20(8)
ZOO14406EA	Medical and Veterinary Entomology & Agricultural Entomology	Elective (Allied)	3	0	1	4	80(32)	20(8)
ZOO14407EA	Applied Zoology IV	Elective (Allied)	3	0	1	4	80(32)	20(8)
ZOO14408EO	General Entomology	Elective (Open)	4	0	0	4	80(32)	20(8)
Credits = 28	Contact Hours = 36		20	4	12	28		

GENERAL INSTRUCTIONS FOR THE CANDIDATES

1. The two year (4 semester) programme is of 96 credits i.e. 24 credits/semester (24x4=96)
2. A candidate has compulsorily to opt for 12 credits from the core component in each semester.
3. A candidate has a choice to opt any 12 credits (3 papers) out of minimum of 16 credits (4 papers) offered as Elective (Allied), except for a particular semester where a candidate is required to gain a minimum of 4 credits (1 paper) from Elective (Open) offered by any other Department/ Faculty.
4. A candidate has compulsorily to obtain a minimum of 4 credits (1 paper) from Elective (Open) from outside the parent Department/Faculty.
5. A candidate can earn more than the minimum required credits (i.e. more than 96 credits for four Semester programme) which shall be counted towards the final result of the candidate.

MAX. MARKS=100 (Internal=20 + External=80) CREDITS =4 (4+0+0)

COURSE CODE: ZOO14401CR

**COURSE TITLE: CELL AND MOLECULAR BIOLOGY, CYTOGENETICS
AND DEVELOPMENTAL BIOLOGY**

UNIT I: CELL CYCLE AND REGULATION

- 1.1. Molecular regulation of cell cycle
- 1.2. Somatic cell gene therapy
- 1.3. Stem cell and animal cloning technology
- 1.4. Apoptosis- mechanism and significance

UNIT II: MOLECULAR BIOLOGY

- 2.1. Conformation of nucleic acids (A, B and Z ó DNA), tRNA and micro- RNA.
- 2.2. Cot curve.
- 2.3. DNA damage and repair
- 2.4. Extra chromosomal inheritance (mitochondria)

UNIT III: CYTOGENETIC

- 3.1. Genomics, Proteomics.
- 3.2. DNA Finger Printing.
- 3.3. Karyotyping and genetic disorders.
- 3.4. Regulation of gene expression in prokaryotes and eukaryotes.

UNIT IV: DEVELOPMENTAL BIOLOGY

- 4.1. Vitellogenesis
- 4.2. Regeneration phenomenon in animals and factors affecting it .
- 4.3. Formation and implantation of blastocyst.
- 4.4. Maternal - Foetal interactions.

MAX.MARKS=100 (Internal=20 + External=80) **CREDITS =4 (4+0+0)**

COURSE CODE: ZOO14402CR

COURSE TITLE : DECIMATING & WELFARE FACTORS AND CARRYING CAPACITY

UNIT I: DECIMATING FACTORS –I

- 1.1. Predation-Types of predation, understanding predation-density, behavior
- 1.2. Effects of predation, alternate prey and predation control
- 1.3. Hunting-harvest measuring, management goals, population management with hunting
- 1.4. Accidents and starvation that kill amphibians, reptiles, birds and mammals

UNIT II: DECIMATING FACTORS-II DISEASES

- 2.1. Basic concept of disease, epidemiology and control measures
- 2.2. Important viral diseases in birds and mammals
- 2.3. Important bacterial diseases in birds and mammals
- 2.4. Important toxic and fungal diseases

UNIT II: WELFARE FACTORS – FOOD AND COVER

- 3.1. Food or Nutrition ó proteins, minerals, vitamins; Nutritional considerations.
- 3.2. Energy requirements and animal condition indices.
- 3.3. Management of water for birds and mammals, benefits of water development
- 3.4. Wildlife Cover as shelter, as concealment. Edges and edge effect.

UNIT III: CARRYING CAPACITY AND METHODS OF STUDY

- 4.1. Ecologically based carrying capacities.
- 4.2. Culturally based carrying capacity
- 4.3. Methods of studying wildlife census
- 4.4. Capture of wild animals- live trapping, mist netting and chemical capture

MAX. MARKS=100 (Internal=20 + External=80) CREDITS =4 (0+0+8)

COURSE CODE: ZOO14403CR

COURSE TITLE : LAB. COURSE-4

1. Field exercise on important wildlife census methods: Drive count, Pugmark census, Line transect and Point count
2. Operation of GPS, Range finder, Pedometer, Field binoculars, Video and Digital Camera
3. Study of hair structures of different mammals
4. Identification of poisonous and non poisonous snakes
5. Survey of museum specimens : Mammals, birds, reptiles, Amphibians, fishes and forest insects
6. Comparative studies of dentition and skull
7. Stuffing procedures of birds and mammals
8. Fecal and gut examination of wild animals for helminth infection
9. Examination and drawing of museum materials : beaks, claws, feathers and hooves
10. Study of vegetation by quadrant method to determine frequency, density, abundance and distribution pattern of different species present in the community
11. Slide preparation of epidermal derivatives of different plant parts
12. Histological/ Histopathology techniques
13. Hematological and Biochemical techniques
14. Study of preserved specimens of human fetus of three trimesters.
15. Study of preserved specimens of mammalian embryos.
16. Study of vitellogenesis through prepared slides.
17. Isolation and study of giant chromosomes of chromosome larva and Drosophila larva.
18. Slide study of various stages of mitotic and meiotic divisions.

MAX. MARKS=100 (Internal=20 + External=80) CREDITS = 4 (3+0+1)

COURSE CODE: ZOO14404EA

COURSE TITLE: CULTURE TECHNIQUES; PATHOLOGY AND FISH PROCESSING

UNIT I: CULTURE TECHNIQUES

- 1.1. Trout,
- 1.2. Indian major carps
- 1.3. Air breathing fishes
- 1.4. Fresh water prawn culture

UNIT II: FISH PATHOLOGY

- 2.1 Importance of fish health in aquaculture.
- 2.2 Parasitic diseases in fishes; symptoms, etiology, prophylaxis and treatment.
- 2.3 Non-Parasitic diseases in fishes; symptoms, etiology, prophylaxis and treatment.
- 2.4 Hybridoma technology and its use in disease diagnostic and therapy.

UNIT III: BIOCHEMICAL COMPOSITION AND FISH PROCESSING

- 3.1. Biochemical composition fish ó proteins, carbohydrates, fat, vitamins and mineral contents
- 3.2. Factors affecting the seasonal variation in biochemical composition of fish.
- 3.3. Fish spoilage and preservation technology.
- 3.4. Shelf life and methods of extended shelf life

UNIT IV: PRACTICALS WORK

- 4.1. Collection and identification of local fish fauna
- 4.2. Visit of local fish farms of the Valley
- 4.3. Study of some parasites of fishes with the help of permanent slides
- 4.4. Moisture conten analysis of fish and feed ingredients
- 4.5. Determination of chemical composition in a typical fish- vitamins and minerals.
- 4.6. Determination of chemical composition in a typical fish- lipids and Proteins..

MAX. MARKS=100 (Internal=20 + External=80) **CREDITS =4 (3+0+1)**

COURSE CODE: ZOO14405EA

COURSE TITLE: INSECT CONTROL AND IPM

UNIT I: CHEMICAL CONTROL

- 1.1. Inorganic insecticides
- 1.2. Organochlorines
- 1.3. Insecticides of plant origin
- 1.4. Organophosphates and carbamates

UNIT II: BIOLOGICAL CONTROL

- 2.1. Biological control-definition with successful examples of classical and modern biological control agents (Parasites/Parasitoids and Predators)
- 2.2. Viral pesticides
- 2.3. Bacterial pesticides
- 2.4. Entomopathogenic fungi

UNIT III: INTEGRATED PEST MANAGEMENT

- 3.1. IPM: concept, strategies and tools in pest management
- 3.2. Role of IPM in insect pest control
- 3.3. Pheromones - types and uses
- 3.4. Cultural and genetic control

UNIT IV: PRACTICALS WORK

- 4.1. To study the parasitoids of lepidopteran pests
- 4.2. To study the predators of insect pests
- 4.3. To study the permanent slides of entomopathogenic fungi
- 4.4. To prepare permanent slides of *Apanteles* spp., *Bracon* spp.
- 4.5. To determine the LC 50 of the following insecticides, Endosulphan, Dichloroas and Carbonic
- 4.6. To collect major insect pests of vegetables and fruits.

MAX. MARKS=100 (Internal=20 + External=80) CREDITS = 4 (3+0=1)

COURSE CODE: ZOO14406EA

COURSE TITLE: MEDICAL AND VETERINARY ENTOMOLOGY AND AGRICULTURAL NEMATOLOGY

UNIT I: MEDICAL ENTOMOLOGY

- 1.1 Insects as vectors of parasitic diseases.
- 1.2 Fleas as vectors of disease and their control.
- 1.3 General account of Cimex spp. as disease-causing and disease-transmitting agents and their control.
- 1.4 General account of Pediculus spp. as disease-causing and disease-transmitting agents and their control.

UNIT II: VETERINARY ENTOMOLOGY

- 2.1 Morphology, life cycle, disease relationship and control of: Phlebotomus and Glossina.
- 2.2 Fly maggots and myiasis.
- 2.3 General account of ticks as vectors of diseases and their control with special reference to Dermacentor, Boophilus and Argas
- 2.4 General account of mites as disease-causing and disease-transmitting agents and their control with special reference to Sarcoptes and Trombicula

UNIT III: AGRICULTURAL NEMATOLOGY

- 3.1. Introduction to plant parasitic nematodes with special reference to pathogenicity and control of *Meloidogyne* and *Heterodera*
- 3.2 Introduction to entomopathogenic nematodes.
- 3.3. Plant resistance to phytoparasitic nematodes.
- 3.4. Management and control of plant parasitic nematodes.

UNIT IV: PRACTICALS AND FIELD SURVEY

- 4.1 Examination of faecal and urine samples seeded with parasitic stages by known parasitological techniques
- 4.2 Collection, preservation, and preparation of permanent slides of Diptera, Siphonaptera, Acarina and Hemiptera.
- 4.3 Study of permanent slides of Arthropods of medical and veterinary importance available in the museum
- 4.4 Collection, preservation and preparation of permanent slides of phytoparasitic nematodes.
- 4.5 Microtomy of Helminth parasites
- 4.6 Students shall conduct a survey by visiting different areas and submit the report in relation to collection of vectors/ parasites/ plant parasitic nematodes from:

MAX.MARKS=100 (Internal=20 + External=80) **CREDITS =4 (3+0+1)**

COURSE CODE: ZOO14407EA

COURSE TITLE: APPLIED ZOOLOGY-IV

UNIT I: BROOD STOCK MANAGEMENT AND LARVAL FEED

- 1.1. Brood stock management in Aquaculture
- 1.2. Determination of breeding season, spawning and fecundity in fishes
- 1.3. Natural larval food and its importance in aquaculture
- 1.4. Formulation and preparation of artificial food for larval rearing

UNIT II : AUTOIMMUNITY.

- 2.1. Theories of breakdown in self-tolerance.
- 2.2. Classification of autoimmune diseases with some important examples
- 2.3. Mechanism of tissue damage in selected autoimmune diseases (e.g. Graves' disease and Rheumatoid-arthritis).
- 2.4. Genetic factors in autoimmune diseases.

UNIT III: BIODIVERSITY VALUES –II of:

- 3.1. Fishes and amphibians.
- 3.2. Reptiles.
- 3.3. Birds.
- 3.4. Mammals

UNIT IV: PRACTICALS WORK

- 4.1. Estimation of fecundity in locally available fish species
- 4.2. Study and identification of natural food organisms of fishes
- 4.3. Study of some important ornamental fishes.
- 4.4. Study of some economically important birds and mammals.
- 4.5. Application of laboratory techniques to identifying and measuring autoantibodies.
- 4.6. Demonstrate knowledge of relevant biomarkers of autoimmune diseases and their measurement.

MAX. MARKS=100 (Internal=20 + External=80) **CREDITS =4 (4+0+0)**

COURSE CODE: ZOO14408EO

COURSE TITLE: GENERAL ENTOMOLOGY

UNIT I: INSECT FAUNA AND THEIR CHARACTERS

- 1.1. Insects: General characters and economically important orders
- 1.2. Mouth parts of insects
- 1.3. Social insects
- 1.4. Household insects

UNIT II: MEDICAL VETERINARY ECONOMIC ENTOMOLOGY

- 2.1. Insect borne diseases of human beings (bacterial and protozoan)
- 2.2. Insect borne diseases of domestic animals (viral and bacterial)
- 2.3. Apiculture
- 2.4. Sericulture

Unit III: PESTS, THEIR CONTROL, INTERACTION AND HAZARDS OF PESTICIDES

- 3.1. Pests- definition and factors for the origin of pests
- 3.2. Biological control agents of pests- general account
- 3.3. Insect plant interactions
- 3.4. Environmental hazards of chemical pesticides

UNIT IV: INSECT COLLECTION, PRESERVATION AND INSECTICIDAL APPLIANCES

- 4.1. Insecticidal appliances.
- 4.2. Aerial spraying ó Advantages and disadvantages.
- 4.3. Insect collection and preservation.
- 4.4. Insecticidal poisoning - treatment