

P. G. Department of Zoology
Syllabus CBCS 2015
University of Kashmir, Srinagar
2nd Semester

M. Sc

POST GRADUATE DEPARTMENT OF ZOOLOGY
UNIVERSITY OF KASHMIR
CHOICE BASED CREDIT SYSTEM (CBCS) SCHEME FORMAT SEMESTER-2nd

Course Code	Course Title	Paper Category	Hours/Week			Credits	Theory Marks		Practical Marks	
			L	T	P		Ext.	Int.	Ext.	Int.
Zoo-201-CR	Anatomy and Physiology of Mammals	Core	3	0	2	4	60(24)	15(6)	20	5
Zoo-202-CR	Ethology and Developmental Biology	Core	3	0	2	4	60(24)	15(6)	20	5
Zoo-203-CR	Ichthyology	Core	3	0	2	4	60(24)	15(6)	20	5
Zoo-204-DCE	Veterinary Parasitology	Discipline Centric	3	0	0	3	60(24)	15(6)	—	—
Zoo-205-DCE	Aquaculture and Fish Nutrition	Discipline Centric	2	0	2	3	40(16)	10(4)	20	5
Zoo-206-DCE	Medical and Veterinary Entomology	Discipline Centric	2	0	2	3	40(16)	10(4)	20	5
Zoo-207-DCE	Biodiversity and Habitat Ecology	Discipline Centric	2	0	2	3	40(16)	10(4)	20	5
Zoo-208-GE	Introduction to Parasitology	Generic Elective	2	0	2	3	40(16)	10(4)	20	5
Zoo-209-GE	Basics of Wildlife Science	Generic Elective	2	0	2	3	40(16)	10(4)	20	5
Zoo-210-OE	Basic and Industrial Entomology	Open Elective	2	0	0	2	40(16)	10(4)	—	—
Zoo-211-OE	Elementary Ichthyology	Open Elective	2	0	0	2	40(16)	10(4)	—	—
Total credits= 34			Contact hours= 42			34				

GENERAL INSTRUCTIONS FOR THE CANDIDATES

1. A candidate has to obtain a minimum of 24 credits per semester i.e., 96 credits in two year programme (4 semesters).
2. Out of 24 credits in a semester a candidate has to obtain 12 credits compulsorily from “**Core Courses**” while the remaining 12 credits can be obtained from the “**Electives**” in the following manner:
 - ▶ A candidate can obtain a maximum of 6 credits within his/her own Department out of the specializations offered by the Department as **Discipline Centric Electives**.
 - ▶ 6 credits shall be obtained by a candidate from the **Electives** offered by the Departments other than his/her own. The candidate shall be free to obtain these 6 credits from the **Generic** or **Open Electives** or a combination of both.
3. A candidate can go with a slow pace and obtain only 20 credits in a semester or 32 credits at a high pace per semester, so as to maintain a total score of 96 credits or above in a 2-year programme (4 semesters).

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ZOO-201-CR: ANATOMY AND PHYSIOLOGY OF MAMMALS

Total Credits: 4 (3 Lecture + 0 Tutorial +1 Practical)

Maximum Marks: 100 (25/Credit)* [Marks Distribution: 20% Internal Assessment & 80% End Semester Exam.]

Minimum Marks: 40% (Internal Assessment and End Semester Exam. to be Qualified Separately, not in Aggregate)

*Note: One unit is equivalent to one credit

UNIT I: ANATOMY AND PHYSIOLOGY-1

- 1.1 Digestive system: Physiology of digestion, absorption, energy balance, BMR
- 1.2 Respiratory system: Comparison of respiration in land and aquatic mammals, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration
- 1.3 Cardiovascular System: Comparative anatomy of heart structure, myogenic heart, specialized tissue, cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation of the above
- 1.4 Blood and circulation: Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, human blood groups, haemostasis

UNIT II: ANATOMY AND PHYSIOLOGY-2

- 2.1 Excretory system: Comparative physiology of excretion, kidney, urine formation, urine concentration, waste elimination, micturition, regulation of water balance.
- 2.2 Nervous system: Neurons, gross anatomy of the brain and spinal cord, peripheral and autonomous nervous system, nerve conduction
- 2.3 Sense organs: Vision and hearing
- 2.4 Physiology of muscle contraction

UNIT III: ANATOMY AND PHYSIOLOGY-3

- 3.1 Skeleton system: Pectoral and pelvic girdles and limbs
- 3.2 Endocrinology: Endocrine glands and their functions
- 3.3 Neuroendocrine regulation and hormonal disorders
- 3.4 Thermoregulation in Animals: Homoeotherms, Poikilotherms; Aestivation and Hibernation

UNIT IV: PRACTICAL WORK

- 4.1 Study of histological slides- T. S. of Stomach, Intestine, liver, lungs, testis and ovary
- 4.2 Determination of the bleeding time and TLC and DLC of human blood
- 4.3 Study of various organ systems through dissection of Rat
- 4.4 Study of skeletal elements of Rabbit
- 4.5 Study of various endocrine glands through prepared slides
- 4.6 Study of various organs of sheep- brain/ eye/ heart/ kidney

SUGGESTED BOOKS/READING MATERIAL

1. Abimal Physiology by **Fred Hainsworth**
2. Animal Physiology – Adaptation and Environment by **Knut Schmidt Nielsen**
3. Animal Physiology – Adaptations & Principles by **Malcoms S. Gordon**
4. Animal Physiology by **Eckert & Randall**
5. Animal Physiology by **James Anderson**
6. Animal Physiology by **Kent**
7. Animal Physiology by **Richard D. Jurd**
8. Animal Physiology by **Richard W. Hill, Gorden A. Wyse & Magarat Anderson**
9. Biological Science by **Tylor et al.**
10. Biology Today by **Sandra S. Gottfried**
11. Comparative Animal Physiology by **Philip C. Withers**

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12. Comparative Physiology by **B. T. Scheer**
13. Essentials of Animal Physiology by **S. C. Rastogi**
14. General & Comparative Physiology by **William S. Hoar**
15. Invertebrate Structure & Function by **E. J. W. Barrington**
16. Physiology of marine Animals by **Winona B. Vernberg & F. John Vernberg**
17. Textbook of Animal Physiology by **R. Nagabhushanam**

ZOO-202-CR: ETHOLOGY AND DEVELOPMENTAL BIOLOGY

Total Credits: 4 (3 Lecture + 0 Tutorial +1 Practical)

Maximum Marks: 100 (25/Credit)* [Marks Distribution: 20% Internal Assessment & 80% End Semester Exam.]

Minimum Marks: 40% (Internal Assessment and End Semester Exam. to be Qualified Separately, not in Aggregate)

*Note: One unit is equivalent to one credit

UNIT I: ECOLOGICAL AND SOCIAL BEHAVIOUR

- 1.1 Home range, Territoriality and Dispersal, Habitat and food selection, optimal foraging theory
- 1.2 Genetic and environmental components in the development of behaviour
- 1.3 Social organization in insects and primates
- 1.4 Parental care and nesting habits in amphibians and birds

UNIT II: REPRODUCTIVE AND LEARNING BEHAVIOUR

- 2.1 Courtship, mating system and role of pheromones in behaviour
- 2.2 Parental investment and reproductive strategies
- 2.3 Learning behaviour in vertebrates
- 2.4 Migration in insects, fishes and mammals

UNIT III: DEVELOPMENTAL BIOLOGY

- 3.1 Gametogenesis, process of blastulation, gastrulation and fate map construction in mammals
- 3.2 Implantation of blastocyst and formation of foetal membranes (in humans)
- 3.3 Role of hormones in pregnancy and parturition and maternal-foetal interactions
- 3.4 Regeneration phenomenon in animals, Histomorphological changes in regeneration of limbs in amphibians and tail in lizards

UNIT IV: PRACTICAL WORK

- 4.1 Study of various types of bird nests
- 4.2 Investigation of hydrotaxis, chemotaxis and phototaxis in earthworm
- 4.3 Field exercises to study various types of behaviour in animals
- 4.4 Study of gametogenesis through prepared slides
- 4.5 Study of invertebrate and vertebrate egg specimens (insects, fishes, frog and hen)
- 4.6 Study of preserved specimens of human foetus of three trimesters

SUGGESTED BOOKS/READING MATERIAL

1. *Animal Behavior* by **John Alcock** Sinauer Associates, Inc Publishers Sunderland, Massachusetts
2. *Animal Behavior* by **M.P. Arora** Himalaya Publishing House
3. *Animal Behaviour* by **Anbery**
4. *Principles and Animal Development* by **S.C. Goel**

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ZOO-203-CR: ICHTHYOLOGY

Total Credits: 4 (3 Lecture + 0 Tutorial +1 Practical)

Maximum Marks: 100 (25/Credit)* [Marks Distribution: 20% Internal Assessment & 80% End Semester Exam.]

Minimum Marks: 40% (Internal Assessment and End Semester Exam. to be Qualified Separately, not in Aggregate)

*Note: One unit is equivalent to one credit

UNIT I: SYSTEMATICS AND MORPHOLOGY

- 1.1 Outline classification of fishes with distinguishing characters and important examples of principal subdivisions
- 1.2 General account and adaptive radiation of Elasmobranchii and Actinopterygii
- 1.3 Structure and function of fins and scales
- 1.4 Colouration in fishes

UNIT II: DIGESTION AND CIRCULATION

- 2.1 Digestion and absorption in fishes: gastric and intestinal enzymes and their mode of action; digestion in stomachless fishes; adaptation of digestive enzymes in fishes
- 2.2 Nutritional energetics and feed conversion ratio
- 2.3 Respirations in fishes; structure and function of gills
- 2.4 Heart and blood vessels in fishes; regulation of heart activity

UNIT III: STRUCTURE AND PHYSIOLOGY

- 3.1 Kidney structure and functions
- 3.2 Endocrine organs in fishes
- 3.3 Structure and function of nervous system
- 3.4 Sense organs and their functions

UNIT IV: PRACTICALS

- 4.1 General survey of Elasmobranchii, Holocephali, Dipnoi and Teleostei; identification and classification of fishes of Jammu & Kashmir
- 4.2 Study of feeding habits of herbivorous, carnivorous and omnivorous fish by gut content analysis of fishes: *Schizothorax*, Trout, Carp
- 4.3 Histological study of different organ systems of fish from prepared slides
- 4.4 Study and mounting of scales of fishes (Carp, *Schizothorax* and *Scoliodon*)
- 4.5 Dissection of nervous system of *Dasyatis* (Sting ray), cranial nerves of *Wallago*
- 4.6 External characters and dissection of fish for internal anatomy: structure of alimentary canal, gill rakers (carp/ or any other available fish)

SUGGESTED BOOKS/READING MATERIAL

1. *Biology of Fishes* by **Quentin Bone et al** Springer

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2. *The Physiology of Fishes* by **Evans, D. H. et al** CRC press
3. *Fishes: An Introduction to Ichthyology* by **Peter B. Moyle Joseph J. Cech Jr.** Prentice Hall India Learning Private Limited
4. *An Introduction to Fishes* by **H.S. Bhamrah, Kavita Juneja** Anmol Publications Pvt Ltd
5. *An introduction to fishes* by **G.S. Sandhu** Campus Books International
6. *Fish and Fisheries* by **B.N. Yadav** Daya Publishing House
7. *A History of Fishes* by **J.R. Norman & P.H. Greenwood** Ernest Benn Limited
8. *Ichthyology: The study of Fishes* by **Karl F. Lagler, John E. Bardach & Robert R.** Miller John Wiley & Sons, Inc.,
9. *Anatomy of Fishes Part I* by **Whihelm Harder E. Schweizerbart'sche** Verlagsbuchhandlung Stuttgart
10. *Fish and Fisheries* by **Pandey and Shukla** Rostogi Publication
11. *Fisheries: An Introduction to Ichthyology* by **Peter B. Moyle & Joseph J. Cech, Jr** Prentice Hall , Upper Saddle River, NJ 0458

ZOO-204-DCE: VETERINARY PARASITOLOGY

Total Credits: 3(3 Lecture + 0 Tutorial +0Practical)

Maximum Marks: 75 (25/Credit)* [Marks Distribution: 20% Internal Assessment & 80% End Semester Exam.]

Minimum Marks: 40% (Internal Assessment and End Semester Exam. to be Qualified Separately, not in Aggregate)

*Note: One unit is equivalent to one credit

UNIT I: PROTOZOA

- 1.1. Protozoan parasites of fishes with special reference to *Trypanosoma*
- 1.2. Protozoan parasites of poultry with special reference to *Eimeria*
- 1.3. Epidemiology, life-cycle, pathogenicity and control of *Babesia* in cattle
- 1.4. Epidemiology, life-cycle, pathogenicity and control of *Toxoplasma* in sheep

UNIT II: PLATYHELMINTHS

- 2.1 Trematode and cestode parasites of fishes with special reference to the morphology, biology and control of *Diplozoon* and *Adenoscolex*.
- 2.2 Trematode and cestode parasites of aves with special reference to life cycle, pathogenicity and control of *Echinistomum* and *Davania*
- 2.3 Trematode and cestode parasites of ruminants with reference to the life cycle, pathogenicity and control of *Dicrocoelium* & *Moniezia*
- 2.4 Anthelmintics: General account

UNIT III: PARASITOLOGY TECHNIQUES

- 3.1 Methods of collection, fixation and preservation of helminth parasites
- 3.2 Methods of permanent mount preparation of helminth parasites
- 3.3 Faecal, blood and urine examinations for diagnosis of parasitic diseases
- 3.4 Microtomy
- 3.5 Micrometry

SUGGESTED BOOKS/READING MATERIAL

1. *Animal Parasitology* by **J. D. Smyth**
2. *Parasitology (Protozoology & Helminthology)* by **K. D. Chatterjee**
3. *Foundations of Parasitology* by **Gerald D. Schmidt and Larry S. Roberts**
4. Besides, the students are asked to visit www.springer & www.biomed for latest advances

ZOO-205-DCE: AQUACULTURE AND FISH NUTRITION

Total Credits: 3 (2 Lecture + 0 Tutorial +1 Practical)

Maximum Marks: 75 (25/Credit)* [Marks Distribution: 20% Internal Assessment & 80% End Semester Exam.]

Minimum Marks: 40% (Internal Assessment and End Semester Exam. to be Qualified Separately, not in Aggregate)

*Note: One unit is equivalent to one credit

UNIT I: AQUACULTURE

- 1.1 Aquaculture; criteria, aquaculture practices and applications of biotechnology in aquaculture
- 1.2 A general account of breeding cycle, breeding season and spawning and induced breeding in fish (Carp)
- 1.3 Importance of fish health in aquaculture; parasitic and non parasitic diseases in fishes; Symptoms, etiology, prophylaxis and treatment
- 1.4 Site Selection, construction and management of fish ponds

UNIT II: FISH NUTRITION

- 2.1 Protein, amino acid, lipid, carbohydrate, vitamins and minerals requirements of fishes
- 2.2 General consideration of diet formulation and fish feed ingredients; feed formulation and nutritional values of fish feed ingredients
- 2.3 Types of feed: wet or moist feed, mixed or semi-moist feed, dry feed, compressed dry pellets, rolled pellets, crumbles, flake feed and microencapsulated feed
- 2.4 Use of probiotics and herbal medicine in aquaculture, use of RNA/DNA ratio in evaluating the performance of feeds

UNIT III: PRACTICALS

- 3.1 Visit to a fish farm/ feed manufacturing units for studying the culture and breeding activities and feed preparation of trout and carp
- 3.2 Study of different stages of fish life cycle through preserved material
- 3.3 Study of various fish diseases through diseased specimen and slides
- 3.4 Proximate analysis of fish feed ingredients (moisture, crude protein, fat and ash contents)
- 3.5 Formulation and preparation of artificial feed (moist, pelleted and crumbled feed)

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1. *Aquaculture - Principles and Practices* by T. V. R. Pillay Wiley-Blackwell; New edition edition (2 April 1993)
2. *Fish and Fisheries of India* by **V. G. Jhingran** Hindustan Publishing Corporation
3. *Aquaculture and Fisheries* by **N Arumugam** Saras Publication
4. *Fish in Nutrition* by **Eirik Heen and Rudolf Kreuzer** Fishing News (Book) Ltd Ludgate house London
5. *Fish Nutrition and Feed Technology* by **S. Athithan, N. Felix & N. Venkatasamy** Daya Publishing House, New Delhi
6. *Fish Nutrition in Aquaculture* by **Y.S. Chandrasekhar** Swastik Publications New Delhi

ZOO-206-DCE: MEDICAL AND VETERINARY ENTOMOLOGY

Total Credits: 3 (2 Lecture + 0 Tutorial +1 Practical)

Maximum Marks: 75 (25/Credit)* [Marks Distribution: 20% Internal Assessment & 80% End Semester Exam.]

Minimum Marks: 40% (Internal Assessment and End Semester Exam. to be Qualified Separately, not in Aggregate)

*Note: One unit is equivalent to one credit

UNIT I: MEDICAL ENTOMOLOGY

- 1.1 Insect-born bacterial and protozoan diseases of man
- 1.2 Insect-born viral and rickettsial diseases of man
- 1.3 Insect causing diseases of man– myiasis (types and causes)
- 1.4 Life-cycle and control of major insect vectors of human diseases viz. Sand fly, Tsetse fly, Mosquito

UNIT II: VETERINARY ENTOMOLOGY

- 2.1 Insects as vectors of bacterial and viral diseases of domestic animals
- 2.2 Insects as vectors of helminthic diseases of domestic animals
- 2.3 Life-cycle and control of major insect vectors of animal diseases viz. *Tabanus*, *Chrysops*
- 2.4 Life-cycle and control of *Hypoderma lineatum* and *Stomoxys calcitrans* causing major animal diseases

UNIT III: PRACTICAL WORK

- 3.1 Collection and laboratory study of major insect vectors of medical importance viz. House fly, Mosquito, Fleas, Bed bug, Cockroach
- 3.2 Collection and laboratory study of major insect vectors of veterinary importance viz. Dipteran flies, Sucking lice, Chewing lice
- 3.3 Study of mouthparts of blood sucking insects– Mosquito, Bed bug
- 3.4 Permanent mount preparation of Body louse, Mosquito, Chewing lice, Fleas
- 3.5 Collection and laboratory study of myiasis causing Dipteran flies

SUGGESTED BOOKS/READING MATERIAL

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1. *Medical & Veterinary Entomology* by **D. S. Kettle**
2. *Modern Entomology* by **D. B. Tembhare** Himalaya Publishing House
3. *Medical & Veterinary Entomology* by **Mullen & Durden** Academic Press
4. *A text book of Applied Entomology –vol. II* by **K.P. Srivastava** Kalyani Publishers
5. *A text book of Applied Zoology* by **Pradip V. Jabde**

ZOO-207-DCE: **BIODIVERSITY AND HABITAT ECOLOGY**
Total Credits: 3 (2 Lecture + 0 Tutorial +1 Practical)

Maximum Marks: 75 (25/Credit)* [Marks Distribution: 20% Internal Assessment & 80% End Semester Exam.]

Minimum Marks: 40% (Internal Assessment and End Semester Exam. to be Qualified Separately, not in Aggregate)

*Note: One unit is equivalent to one credit

UNIT I: BIODIVERSITY: COMPONENTS, VALUES AND LAWS

- 1.1 Concept and levels of biodiversity: species diversity, genetic diversity and ecosystem diversity; values of biodiversity
- 1.2 Biodiversity hotspots and loss of biodiversity: causes and factors
- 1.3 Convention on biological diversity (CBD) and issues under the CBD
- 1.4 Biological diversity Act, 2002 main provisions and rules

UNIT II: HABITAT ECOLOGY

- 2.1 Ecology of major wildlife habitats: deserts, grasslands, forests and aquatic
- 2.2 Wildlife habitats of J & K, their important floral and faunal elements
- 2.3 Wetlands: threats and management with special reference to J & K
- 2.4 Physical and anthropogenic factors affecting wildlife habitats

UNIT III: PRACTICAL WORK

- 3.1 Study of vegetation by quadrat method to determine frequency, density, abundance and distribution pattern
- 3.2 Study of species diversity by various methods
- 3.3 Comparative study of structural adaptations of some birds and mammals

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- 3.4 Survey of herpetofaunal elements preserved in the museum
- 3.5 Visit to any wetland for studying bird diversity

SUGGESTED BOOKS/READING MATERIAL

- 1. *Biodiversity: Perception, Peril and Preservation*, by **Prabodh, K. Maiti and Paulami Maiti** (2011) PHI Learning Pvt Ltd. New Delhi
- 2. *Global Biodiversity, Status of the Earth's Living Resources*, by **Groombridge, B.** (1992). Chapman and Hall, New York
- 3. *Ecology: Principles and Applications* by **J.L. Chapman and M. J. Reiss** (1992) Cambridge University Press
- 4. *Ecology and Field Biology*, **Robert. L. Smith** (1966) Harper & Row Publishers New York
- 5. *Ecology*, **Stanley I. Dodson et al.** (1998) Oxford University Press

ZOO-208-GE: INTRODUCTION TO PARASITOLOGY

Total Credits: 3 (2 Lecture + 0 Tutorial +1 Practical)

Maximum Marks: 75 (25/Credit)* [Marks Distribution: 20% Internal Assessment & 80% End Semester Exam.]

Minimum Marks: 40% (Internal Assessment and End Semester Exam. to be Qualified Separately, not in Aggregate)

*Note: One unit is equivalent to one credit

UNIT I: BASIC PARASITOLOGY AND PROTOZOOLOGY

- 1.1 Basic concepts and definitions in parasitology
- 1.2 Host parasite relationships- general account
- 1.3 Important protozoan diseases of Man with special reference to life cycle, pathogenicity and control of *Entamoeba histolytica*
- 1.4 Opportunistic protozoan parasites of man with special reference to *Pneumocystis carinii* and *Cryptosporidium parvum*

UNIT II: HELMINTHOLOGY

- 2.1 Trematode parasites of man with special reference to life cycle, pathogenicity and control *Schistosomes haematobium*
- 2.2 Cestode parasites of man with reference to life-cycle, pathogenicity, and control of *Taenia saginata*
- 2.3 Nematode parasites of man with special reference to life- cycle, pathogenicity and control of *Entrobilus vermicularis*

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2.4 Anthelmintics: general account

UNIT III: PRACTICAL WORK

- 3.1 Study of slides of protozoan parasites: *Entamoeba*, *Balantidium*, *Trypanosoma* & *Plasmodium*
- 3.2 Preparation of permanent mounts of any parasitic protozoan
- 3.3 Study of slides of helminth parasites: *Fasciola*, *Taenia*, *Entrobrius* & *Ancylostoma*
- 3.4 Processing, staining and mounting of *Dicrocoelium* and *T. saginata*
- 3.5 Processing and mounting of nematode (*Trichuris*)

SUGGESTED BOOKS/READING MATERIAL

1. *Animal Parasitology* by **J. D. Smyth**
2. *Parasitology (Protozoology & Helminthology)* by **K. D. Chatterjee**
3. *Foundations of Parasitology* by **Gerald D. Schmidt and Larry S. Roberts**
4. Besides, the students are asked to visit www.springer & www.biomed for latest advances

ZOO-209-GE : BASICS OF WILDLIFE SCIENCE

Total Credits: 3 (2 Lecture + 0 Tutorial +1 Practical)

Maximum Marks: 75(25/Credit)* [Marks Distribution: 20% Internal Assessment & 80% End Semester Exam.]

Minimum Marks: 40% (Internal Assessment and End Semester Exam. to be Qualified Separately, not in Aggregate)

*Note: One unit is equivalent to one credit

UNIT 1: MAMMALOLOGY AND ORNITHOLOGY

- 1.1 Wildlife: introduction and importance
- 1.2 Mammals: introduction, morphological adaptations (aquatic and amphibious, aerial and cursorial) and physiological adaptations
- 1.3 Distribution of important mammalian taxa in different biogeographical zones of India
- 1.4 Birds: Introduction, morphological and flight adaptations, migration, migratory pathways, threats to migrant population

UNIT II: HERPETOLOGY, HUMAN-WILDLIFE CONFLICT AND WILDLIFE OF JAMMU & KASHMIR

- 2.1 Detail description, status and distribution of some important Indian amphibian species, parental care in amphibians.

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- 2.2 Status and distribution of some important Indian species of turtles, crocodiles, lizards and snakes, adaptations in reptiles, sexual dimorphism and sex determination.
- 2.3 Human- wildlife conflict and its management
- 2.4 An overview of wildlife of Jammu & Kashmir with detailed description on status and distribution of Markhore, Snow leopard, Hangul deer and Tibetan antelope

UNIT III: PRACTICAL WORK

- 3.1 Comparative study of structural adaptations of some birds and mammals
- 3.2 Identification of poisonous and non-poisonous snakes
- 3.3 Study of wetland avifauna (waterfowl) through preserved museum specimens
- 3.4 Preparation of reference slides of hair samples of different mammals
- 3.5 Examination and drawing of museum materials: beaks, claws and feathers

SUGGESTED BOOKS/READING MATERIAL

1. *Biodiversity: Perception, Peril and Preservation*, by **Prabodh, K. Maiti and Paulami Maiti** (2011) PHI Learning Pvt Ltd. New Delhi
2. *Global Biodiversity, Status of the Earth's Living Resources*, by **Groombridge, B.** (1992). Chapman and Hall, New York
3. *Ecology: Principles and Applications* by **J.L. Chapman and M. J. Reiss** (1992) Cambridge University Press
4. *Ecology and Field Biology*, **Robert. L. Smith** (1966) Harper & Row Publishers New York
5. *Ecology*, **Stanley I. Dodson et al.** (1998) Oxford University Press

ZOO-210-OE : BASIC AND INDUSTRIAL ENTOMOLOGY

Total Credits: 2 (2 Lecture + 0 Tutorial +0 Practical)

Maximum Marks: 50 (25/Credit)* [Marks Distribution: 20% Internal Assessment & 80% End Semester Exam.]

Minimum Marks: 40% (Internal Assessment and End Semester Exam. to be Qualified Separately, not in Aggregate)

*Note: One unit is equivalent to one credit

UNIT I: INTRODUCTION TO INSECTS

- 1.1 Gross external morphology of insects
- 1.2 Mouthparts of Cockroach and Mosquito
- 1.3 Antennae of insects
- 1.4 Insect leg and its modifications

UNIT II: INDUSTRIAL ENTOMOLOGY

- 2.1 Insects in industry– Apiculture

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- 2.2 Insects in industry– Sericulture
- 2.3 Insects in industry– Lac culture

SUGGESTED BOOKS/READING MATERIAL

- 1. *A text book of Applied Entomology* by **K. P. Srivastava** Kalyani Publishers
- 2. *Modern Entomology* by **D. B. Tembhare** Himalaya Publishing House
- 3. *A text book of Applied Zoology* by **Pradip V. Jabde**

ZOO-211-OE: ELEMENTARY ICHTHYOLOGY

Total Credits: 2(2 Lecture + 0 Tutorial +0 Practical)

Maximum Marks: 50 (25/Credit)* [Marks Distribution: 20% Internal Assessment & 80% End Semester Exam.]

Minimum Marks: 40% (Internal Assessment and End Semester Exam. to be Qualified Separately, not in Aggregate)

*Note: One unit is equivalent to one credit

UNIT I: FISH

- 1.1 General account on characteristics of pisces
- 1.2 Setting up and maintenance of aquaria

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- 1.3 Larvivorous fishes and ornamental fishes
- 1.4 Nest building and parental care in fishes

UNIT II: SPECIAL ORGANS IN FISHES

- 2.1 Electric organs in fishes
- 2.2 Poison and venom in fishes
- 2.3 Colouration in fishes
- 2.4 Bioluminescence in fishes

SUGGESTED BOOKS/READING MATERIAL

1. *Fishes: An Introduction to Ichthyology* by **Peter B. Moyle Joseph J. Cech Jr.** Prentice Hall India Learning Private Limited
2. *A Text Book of Fish Biology & Fisheries* by **S S Khanna and H R Singh** Narendra Publishing House
3. *An Introduction to Fishes* by **H.S. Bhamrah, Kavita Juneja** Anmol Publications Pvt Ltd
4. *Fish and Fisheries* by **B.N. Yadav** Daya Publishing House