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<th>Paper Category</th>
<th>Hours/Week</th>
<th>Credits</th>
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<td>Zoo-111-OE</td>
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<td>Open Elective</td>
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**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).
P. G. Department of Zoology  
CBCS 2015  
University of Kashmir, Srinagar  
Semester

Zoo-101-CR: ANIMAL TAXONOMY AND BIOSYSTEMATICS  
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: PRINCIPLES AND METHODS OF ZOOLOGICAL CLASSIFICATION
1.1 Introduction: Terms and definitions  
1.2 Taxonomic characters  
1.3 Curating of collections  
1.4 Taxonomic keys- kinds, merits & demerits

UNIT II: PRINCIPLES AND APPLICATION OF ZOOLOGICAL NOMENCLATURE
2.1 Taxonomic ranks and categories  
2.2 ICZN, Homonymy, Synonymy and Law of priority  
2.3 Typification and different Zoological types  
2.4 Intraspecific Categories and their taxonomic status

UNIT III: DIMENSIONS OF SPECIATION/ NEW TRENDS IN TAXONOMY
3.1 Species concepts (Morphological and Biological) – their merits & demerits  
3.2 Speciation: allopatric, sympatric and parapatric with examples  
3.3 Cytotaxonomy with special reference to chromosome evolution in primates and grasshoppers  
3.4 Molecular taxonomy– concept of DNA taxonomy; construction of phylogenetic trees using mitochondrial DNA/ or other markers

UNIT IV: PRACTICAL WORK
4.1 Curating techniques of taxonomic collection  
4.2 Identification of some common faunistic elements of Kashmir region  
4.3 Collection and identification of different species of butterflies & grasshoppers  
4.4 Collection and identification of different types of insects and their larvae  
4.5 Chromosome study in aphids/ grasshoppers  
4.6 Construction of taxonomic keys of the given specimens (Amphibians, Reptiles and Mammals)

SUGGESTED BOOKS/READING MATERIAL
3. An Introduction to Taxonomy by T. C. Narendran  
4. Biosystematics & Taxonomy by R. C. Tripathi  
5. Animal Taxonomy by V.C. Kapoor  
6. Genomes by T. A. Brown BIOS  
7. Biology by Campbell and Reece Pearson Education  
8. Strickberger’s Evolution by Brian K. Hall and Benedikt Hallgrimsson Jones & Bartlett Learning
ZOO-102-CR: STRUCTURE AND FUNCTION OF INVERTEBRATES
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: PROTOZOA, PORIFERA AND COELENTERATA
1.1 Flagellar and Ciliary movements in protozoa
1.2 Colonial protozoans and theories on origin of metazoa
1.3 Canal system, skeleton and reproduction in porifera
1.4 Coelenterata: Nematocysts, polymorphism in hydrozoa, coral reefs

UNIT II: ANNELIDS AND ARTHOPODS
2.1 Annelids: origin & organization of coelom
2.2. Adaptive radiation in polychaetes; trochophore larva and its evolutionary significance
2.3 Arthropoda: Crustacean larvae and their significance, importance of Peripatus
2.4 Respiration and excretion in Arthropods

UNIT III: MOLLUSCA, ECHINODERMATA AND MINOR PHYLA
3.1 Mollusca: Respiration, Nervous system (Cephalopoda)
3.2 Modification of foot and economic importance of Mollusca
3.3 Echinodermata: Water vascular system; larval forms and their significance
3.4 Salient features and affinities of minor phyla: Mesozoa, Phoronida, Ctenophora, Endoprocta and Rotifera

UNIT IV: PRACTICAL WORK
4.1 Study of prepared slides and museum specimens of invertebrate phyla (5 from each phylum)
4.2 Identification of different types of insect larvae
4.3 Permanent slide mount preparation of crustacean larvae
4.4 Nervous system in Annelida & Mollusca–Earthworm/Nerises/Loligo/Sepia/Octopus
4.5 Dissection of Sea Urchin to expose Aristotle’s Lantern
4.6 Dissection of Star Fish/ Sea Cucumber so as to expose its, digestive system, reproductive system and water vascular system

SUGGESTED BOOKS/READING MATERIAL
4. Invertebrate Zoology Jordon Verma
5. Invertebrate Zoology P.S.Verma
ZOO-103-CR: GENERAL PARASITOLOGY
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: INTRODUCTION TO PARASITOLOGY
1.1 Basic concepts and definitions in parasitology with emphasis on animal associations
1.2 Distribution of parasites in animal kingdom
1.3 Parasitic adaptations
1.4 Host parasite relationships – general account

UNIT II: PROTOZOOLOGY
2.1 General characters and outline classification of parasitic protozoans
2.2 Morphology, life cycle, pathogenicity and control of Entamoeba histolytica
2.3 Opportunistic protozoan parasites of man: Pneumocystis carinii & Cryptosporidium parvum
2.4 Host immune response to protozoan

UNIT III: HELMINTHOLOGY
3.1 General characters and outline classification of helminths upto orders
3.2 General life cycle and larval forms in trematodes
3.3 General life cycle and larval forms in cestodes
3.4 Life cycle patterns in nematodes

UNIT IV: PRACTICAL WORK
4.1 Slide study of protozoan parasites: Entamoeba, Balantidium, Trypanosoma & Plasmodium
4.2 Preparation of permanent mounts of parasitic protozoans
4.3 Slide study helminth parasites: Fasciola, Taenia, Entrobius & Ancylostoma
4.4 Processing, staining and mounting of Trematode and Cestode parasites
4.5 Processing and mounting of nematode parasites
4.6 Enface view of any Nematode

SUGGESTED BOOKS/READING MATERIAL
1. Introduction to Parasitology by ASA C. Chandler & Clark P. Read
2. Parasitology by Elmer R. Nobel and Glenn A. Noble
3. Animal Parasitology by J. D. Smyth
4. Parasitology (Protozoology & Helminthology) by K. D. Chatterjee
5. *Foundations of Parasitology* by Gerald D. Schmidt and Larry S. Roberts
7. *Foundations of Parasitology* by Larry S. Roberts, John Janovy and Steve Nadler
8. *Helminthes Arthropods and Protozoa of Domesticated Animals* by EJL Soulsby
10. *Monning’s Veterinary Helminthology and Entomology* by Geoffrreg Lapage
11. Besides, the students are asked to visit [www.springer](http://www.springer) & [www.biomed](http://www.biomed) for latest advances

**ZOO-104-DCE: MEDICAL PARASITOLOGY AND IMMUNOLOGY**

Total Credits: 3 (3 Lecture + 0 Tutorial +0 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: NATURE AND CONSEQUENCES OF PARASITISM**
1.1. Factors influencing parasitic prevalence
1.2. Resistance to parasitic diseases
1.3. Zoonosis
1.4. Larva migrans

**UNIT II: MEDICAL PARASITOLOGY**
2.1. Protozoans parasites of man with special reference to life-cycle, pathogenicity, and control of *Trypanosoma*
2.2. Trematode parasites of man with special reference to *Schistosoma haematobium*
2.3. Cestode parasites of man with reference to life-cycle, pathogenicity, and control of *Taenia saginata*
2.4. Nematode parasites of man with special reference to life-cycle, pathogenicity and control of *Entrobius vermicularis*

**UNIT III: DEFENCE MECHANISM IN HIGHER VERTEBRATES**
3.1. Innate and acquired immunity
3.2. Cell mediated and humoral immunity
3.3. Complement system-general account
3.4. Immuno-deficiency diseases

**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. Immunology by Kuby, J., Goldsby, R., Kindt, T.J. and Osbourne, B.A., W.H. Freeman
5. Medical Immunology for Students by Playfair, J.H.L. and Lydyard, P.M. Churchill
6. Immunology by Roitt, I.M., Brostoff, J. and Male, D. Mosby
7. Basic Immunology by Sharon, J. William and Wilkins
8. Immunology by P. M. Lydyard, A. Whelan And M. W. Fanger
9. Immunology by F. M. Burnet
10. The Complement System by Manfred M. Mayer

Besides, the students are asked to visit www.springer & www.biomed for latest advances

ZOO-105-DCE: FISH ANATOMY AND REPRODUCTION
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: ANATOMY AND SPECIAL ORGANS
1.1 Accessory respiratory organs and Weberian Ossicles in fishes
1.2 Musculature in fishes
1.3 Electric organs: Location, structure, origin and functions
1.4 Poison and venom in fishes

UNIT II: REPRODUCTION & DEVELOPMENT
2.1 Reproductive organs in fishes.
2.2 Nest building and parental care in fishes
2.3 Fecundity--measurement and factors affecting fecundity
2.4 Types of eggs and fertilization; hatching and metamorphosis

UNIT III: PRACTICAL WORK
3.1 Dissection and study of accessory respiratory organs in Anabas and Ophicephalus
3.2 Dissection and study of accessory respiratory organs in Clarias and Heteropneustes
3.3 Study of weberian ossicles of carp
3.4 Electric organs and their nervous innervations in Torpedo
3.5 Dissection of reproductive system; Determination of fecundity (absolute and relative fecundity) in Carp

SUGGESTED BOOKS/READING MATERIAL
1. Fish and Fisheries by B.N. Yadav Daya Publishing House
2. Fish Physiology: Fish Biomechanics by Shadwick & Lauder Academic Press
3. The Physiology of Fishes by Margaret E. Brown Academic Press
7. *Fish and Fisheries* by Pandey and Shukla Rostogi Publication

ZOO-106-DCE: INSECT ANATOMY AND PHYSIOLOGY
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: INSECT ANATOMY
1.1 Digestive System
1.2 Respiratory System
1.3 Circulatory System
1.4 Nervous System

UNIT II: INSECT PHYSIOLOGY
2.1 Physiology of digestion and assimilation
2.2 Physiology of respiration
2.3 Physiology and biochemistry of haemolymph, haemocyte and their function
2.4 Malpighian tubules and formation of uric acid

UNIT III: PRACTICAL WORK
3.1 Major dissections: Digestive, Respiratory and Nervous system of Grasshopper, Cricket and Cockroach
3.2 Isolation and permanent slide mount preparation of malpighian tubules of Grasshopper
3.3 Minor dissection/ temporary mount preparation of trachea and salivary glands of Grasshopper
3.4 Study of haemocytes in insects
3.5 Collection of insects from different localities of Kashmir
P. G. Department of Zoology
CBCS 2015
University of Kashmir, Srinagar
Semester

Syllabus

M. Sc 1st

SUGGESTED BOOKS/READING MATERIAL
4. *Imm’s General Text Book of Entomology* vol. I by O. W. Richards and R.G. Davis Springer
5. *Entomology* by Cedric Gillott
6. *Handbook of Entomology* by M.R. DHINGRA
8. *Entomology* by D. N. Roy and A. W. A. Brown

ZOO-107-DCE: BIOLOGY OF INDIAN WILDLIFE
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: MAMMALOGY AND INDIAN MAMMALS
1.1 Diversity and classification of mammals with detailed treatment of orders represented in the Indian subcontinent
1.2 Adaptation in mammals: hibernation, aestivation, locomotion and water regulation
1.3 Metabolism and thermoregulation: ectothermy, homeothermy and cold stress
1.4 Status and distribution of major mammalian taxa of the family Cervidae, and order Carnivora and Primates

UNIT II: ORNITHOLOGY AND HERPETOLOGY
2.1 Avian systematics and classification of Indian birds, Avifauna of different habitats (montane, aquatic and desert) of India
2.2 Important bird areas of India and their conservation
2.3 Bird migration, migratory pathways, threats to migrant population
2.4 Biology of major Indian amphibians and reptiles: frogs, lizards and crocodiles

UNIT III: PRACTICAL WORK
3.1 Examination and drawing of museum specimens of birds (passerine and raptorial)
3.2 Comparative studies of dentition and skull of different mammals
3.3 Mapping distribution of primates, carnivores and ungulates
3.4 Examination and drawing of museum materials: beaks, claws, feathers and nests of characteristic species
3.5 Identification of poisonous and non-poisonous snakes

SUGGESTED BOOKS/READING MATERIAL
5. Reptiles and Amphibians, Richard Oulahan 1977 Time-Life Films, Inc. USA

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ZOO-108-GE: AQUACULTURE AND FISH PROCESSING TECHNOLOGY
Total Credits: 3 (2 Lecture + 0 Tutorial +1 Practical)

Maximum Marks: 75 (25/Credit)*
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 Production level and role of aquaculture in food supply; types of culture
1.2 Site Selection, construction and management of fish ponds
1.3 Induced breeding in carps
1.4 Principle of organic aquaculture; procurement of stocking material for aquaculture; fish seed identification with special emphasis on Indian major carp

UNIT II: FISH PROCESSING
2.1 Biochemical composition and factor affecting biochemical composition in fishes
2.2 Fish by-product and their preparation, quality control in fish processing industry
2.3 Shelf life and methods of extending shelf life; use of antibiotics in fish preservation
2.4 Principle of freezing, chilling and thermal processing
UNIT III:  PRACTICALS
3.1 Identification and classification of fishes of Jammu & Kashmir
3.2 Visit to a fish farm for studying the culture and breeding activities of trout
3.3 Study of different stages of fish life cycle through preserved material
3.4 Analysis of moisture and ash content from fish flesh
3.5 Preservation and curing of fishes

SUGGESTED BOOKS/READING MATERIAL
2. Fish and Fisheries of India by V. G. Jhingran Hindustan Publishing Corporation
3. Aquaculture and Fisheries by N Arumugam CRC publication
4. Fish And Fisheries by B.N. Yadav Daya Publishing House
7. The Physiology of Fishes by Margaret E. Brown Academic Press
8. Fish in Nutrition by Eirik Heen & Rudolf Kreuzer Fishing News (Book) Ltd Ludgate house London

ZOO-109-GE: 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 Life-cycle and control of major insect vectors of human diseases, viz. Sand fly, Tsetse fly, Mosquito
1.2 Fleas as vectors of human diseases with emphasis on life cycle and control of Xenopsylla and Pulex species
1.3 Insect-born rickettsial and protozoan diseases of man
1.4 Insect causing diseases of man– myiasis (types and causes)

UNIT II: VETERINARY ENTOMOLOGY
2.1 Life-cycle and control of the vectors Hypoderma lineatum and Stomoxys calcitrans causing major animal diseases
UNIT I: WILDLIFE MANAGEMENT IN INDIA
1.1 Introduction and importance of wildlife
1.2 Important National parks of India with the concept of their creation
1.3 Wildlife Protection Act (1972), its brief structure and recent amendments
1.4 Conservation projects in India: Tiger, Hangul & Crocodile projects

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
3.4 Permanent mount preparation of Body louse, Mosquito, Chewing lice, Fleas
3.5 Collection and laboratory study of myiasis causing flies

SUGGESTED BOOKS/READING MATERIAL
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
5. A text book of Applied Zoology by Pradip V. Jabde

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 II: WILDLIFE MANAGEMENT IN J & K

2.1 Wildlife of Jammu & Kashmir - an overview
2.2 Status and distribution of Markhor, Hangul deer and Tibetan antelope
2.3 Status, distribution and management of Waterfowl and Pheasants
2.4 Man–animal conflict and its management

SUGGESTED BOOKS/READING MATERIAL

4. www.jkwildlife.com

ZOO-111-OE: PARASITOLOGY IN RELATION TO PUBLIC HEALTH

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 1: INTRODUCTION TO PARASITOLOGY

1.1 Introduction to animal associations
1.2 Distribution of parasites in animal kingdom
1.3 Introduction to protozoa with special reference to protozoan parasites of man in Kashmir valley
1.4 Description, life-cycle, pathogenicity and control of *Entamoeba histolytica*

UNIT 2: MEDICAL HELMINTHOLOGY

2.1 Cestode parasites of man with reference to life-cycle, pathogenicity and control of *Taenia saginata*
2.2 Trematode parasites of man with special reference to life-cycle, pathogenicity and control of *Schistosoma haematobium*
2.3 Nematode parasite of man with special emphasis on description, life-cycle, pathogenicity and control of *Enterobius vermicularis*

SUGGESTED BOOKS/READING MATERIAL

1. Introduction to Parasitology by ASA C. Chandler & Clark P. Read
2. Parasitology by Elmer R. Nobel and Glenn A. Noble
3. Animal Parasitology by J. D. Smyth
4. Parasitology (Protozoology & Helminthology) by K. D. Chatterjee