

Choice Based Credit System (CBCS) Scheme for 1st Semester

Course Code	Course Title	Course Type	Hours / Week			Credits	Examinations / Marks		
			L	T	P		Continuous Assessment I	Continuous Assessment II	Term End Examination
ZO17101CR	Animal Taxonomy and Evolution	Core	4	0	0	4	25 marks	25 marks	50 marks
ZO17102CR	Structure and Function of Invertebrates	Core	4	0	0	4	25 marks	25 marks	50 marks
ZO17103CR	Field Study+Lab Course	Core	0	2	6	1+3	25 marks	-	75 marks
ZO17104DCE	General and Medical Parasitology	Discipline Centric	3	0	0	3	25 marks	-	50 marks
ZO17105-DCE	Veterinary Parasitology	Discipline Centric	3	0	0	3	25 marks	-	50 marks
ZO17106DCE	General Parasitology & Techniques	Discipline Centric	0	0	4	2	-	-	50 marks
ZO17001GE	Medical and Veterinary Entomology	Generic Elective	2	0	0	2	-	-	50 marks
ZO17002GE	Basics of Wildlife Sciences	Generic Elective	2	0	0	2	-	-	50 marks
ZO17001OE	Fish & Fish Nutrition	Open Elective	2	0	0	2	-	-	50 marks

GENERAL INSTRUCTIONS

1. A candidate has to obtain 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 compulsorily obtain 12 credits from “**Core Courses**” (CR) while the remaining 12 credits can be obtained from the “**Electives**” in the following manner:
 - ▶ A candidate has to obtain 8 credits from his/her own Department as **Discipline Centric Electives (DCE)**.
 - ▶ 4 credits shall be obtained by a candidate from the **Electives** offered by the Departments other than his/her own. A candidate shall be free to obtain these 4 credits from the **Generic** or **Open Electives** or a combination of both; however, all 4 credits can be obtained from Generic Electives, but a maximum of 2 credits can be obtained from Open Electives.
3. Maximum Marks per Credit = 25 (One unit is equivalent to one credit).
4. One Credit in Theory is 16 hours direct teaching learning; where as in Practicals and Tutorials it is 32 hours.

Course No.: ZO17101CR

Course Title: Animal Taxonomy and Evolution

Total Credits: 4 (4 L + 0 T + 0 P)

Maximum Marks: 100 (25 + 25 + 50)

Unit I: Principles and Methods of Zoological Classification

- 1.1 Introduction: Terms and definitions, strategy of systematic research, future of systematics
- 1.2 Taxonomic characters: definition and kinds - morphological, physiological, molecular, ecological, behavioral and geographical
- 1.3 Curating of collections: preparation of material, housing, cataloging, arrangement of collection, curating of types, exchange of material and loans
- 1.4 Taxonomic keys: definition and kinds- bracket key, indented key and pictorial key

Unit II: Principles and Application of Zoological Nomenclature

- 2.1 ICZN: Historical background, Overview of Terms, Principles and Articles
- 2.2 Homonymy, Synonymy and Law of priority
- 2.3 Typification: Definitions, kinds and significance
- 2.4 Intraspecific Categories and their taxonomic status

Unit III: Dimensions of Speciation/ New Trends in Taxonomy

- 3.1 Species concepts: Morphological, Biological and Phylogenetic
- 3.2 Mechanisms of Speciation: Allopatric, Sympatric and Parapatric
- 3.3 Cytotaxonomy: back ground, chromosome evolution with specific reference to primates and grasshoppers
- 3.4 Molecular taxonomy:
 - a) Concept of phylogenetic systematics.
 - b) Construction of phylogenetic trees.

Unit IV: Evolution

- 4.1 Origin of life on earth, Special creation theory, Abiogenesis and Biogenesis
- 4.2 Modern synthetic theory of organic evolution, Genetic variations, Natural Selection, Isolation.
- 4.3 Convergent and divergent evolution
- 4.4 Speciation: Isolating mechanisms, Geographical isolation, Reproductive isolation

Suggested Books / Reading Material

1. *Principles of Systematic Zoology* by **Ernst Mayr** Tata McGraw Hill Publishing Company.
2. *Principles of Systematic Zoology* by **Peter D. Ashlock and Ernst Mayr** Tata McGraw Hill Publishing Company.
3. *An Introduction to Taxonomy* by **T. C. Narendran**.
4. *Biosystematics & Taxonomy* by **R. C. Tripathi**.
5. *Animal Taxonomy* by **V.C. Kapoor**.
6. *Organic Evolution* by **N Arumugam** Saras Publication
7. *Genomes* by **T. A. Brown** BIOS.
8. *Biology* by **Campbell and Reece** Pearson Education.
9. *Strickberger's Evolution* by **Brian K. Hall and Benedikt Hallgrimsson** Jones & Bartlett Learning.

Course No.: ZO17102CR

Course Title: **Structure and Function of Non-Chordates**

Total Credits: **4** (4 L + 0 T + 0 P)

Maximum Marks: **100** (25 + 25 + 50)

Unit I: Protista and Porifera

- 1.1 General account of Protista - Classification and Nutrition
- 1.2 Locomotion, Reproduction and economic importance of Protista
- 1.3 Origin, affinities and classification of Porifera
- 1.4 Canal system, skeleton and reproduction in Porifera

Unit II: Cnideria and Helminths

- 2.1 General account and Classification of Cnideria
- 2.2 Polymorphism in Cnideria, Corals and Coral reefs
- 2.3 General account of Helminths
- 2.4 Larval forms of Cestodes and Trematodes

Unit III: Annelida and Arthropoda

- 3.1 Annelida: Nervous System, Adaptive radiation in Polychaetes, Trochophore larva and its evolutionary significance
- 3.2 Economic importance of Annelida; Vermiculture and Vermicomposting
- 3.3 Arthropoda: Crustacean larvae and their phylogenetic significance, Metamorphosis in Insects, Importance of *Peripatus*
- 3.4 Respiration and Excretion in Arthropods (Aquatic and Terrestrial)

Unit IV: Mollusca and Echinodermata

- 4.1 Mollusca: General account, Respiration, Nervous system (Cephalopoda) and General account on colouration & ink in Mollusca
- 4.2 Modification of foot, Shell in Mollusca, Torsion in gastropods and Economic importance of Mollusca
- 4.3 Echinodermata: General characters & Taxonomic history, Water vascular system, Autotomy & Regeneration
- 4.4 Echinodermata: Larval forms and their significance

Suggested Books / Reading Material

1. Barnes: Invertebrate Zoology, Holt-Saunders International, 4th edition, 1980.
2. Barnes: The Invertebrates – A synthesis, 3rd edition, Blackwell, 2001.
3. Hunter: Life of Invertebrates, Collier Macmillan Pub. 1979 .
4. Invertebrate Zoology [Jordon & Verma](#).
5. Invertebrate Zoology [P. S. Verma](#).
6. Marshall: Parker & Haswell Text Book of Zoology, Vol. I, 7th edition, Macmillan, 1972.
7. Modern Text Book of Zoology: Invertebrates [R. L. Kotpal](#).
8. Moore: An Introduction to the Invertebrates, Cambridge University Press, 2001.
9. Textbook of Invertebrate Zoology G. S. Sandhu & H. Bhaskar, 2004.
10. Non-chordate Zoology by Dhama, P. S. & Dhama, J. K., R. Chand & Co.

Course Code: ZO17103CR

Course Title: Practicals based on 101-CR & 102-CR

Total Credits: 4 (0 L + 1 T* + 3 P)

Maximum Marks: 100 (25 + 75)

Part A*: Field surveys to various parts of Jammu & Kashmir for collection, identification and presentation of local fauna.

Part B: Practicals

1. Collection and identification of different species of butterflies & grasshoppers
2. Collection and identification of different types of insects and their larvae
3. Construction of taxonomic keys within Class group taxa
4. Slide / Specimen study of Protista
5. Permanent mount preparation of Protista
6. Slide / Specimen study of Porifera
7. Slide / Specimen study of Cnideria
8. Slide / Specimen study of Helminths
9. Permanent mount preparation of Cnideria (Obelia / Hydra)
10. Slide study of larval forms of Cestodes and Trematodes
11. Specimen study of Annelida
12. Nervous system in Annelida (Earthworm / Neries)
13. Specimen study of Arthropoda
14. Mouth parts and sting apparatus of honey bee
15. Slide study of Larval forms of Crustacea
16. Permanent mount preparations of Crustacean larvae
17. Specimen study of Mollusca
18. Nervous system of Mollusca – Loligo / Sepia / Octopus
19. Specimen study of Echinodermata
20. Dissection of Star Fish so as to expose its digestive system and water vascular system

***Field Collection:** The students in 1st semester shall have to earn 1 credit for field survey. A visit of about a week within the state would be conducted and the students are expected to collect fauna of that particular region and present the same to the Department in a processed form alongwith a write-up. The evaluation shall be done by an evaluation committee to be framed for the purpose by the Department. If for any genuine reason, a student is not in a position to join the field trip, he/she shall get the fauna of his/her native place.

Course Code: ZO17104DCE

Course Title: **General and Medical Parasitology**

Total Credits: **3** (3 L + 0 T + 0 P)

Maximum Marks: **75** (25 + 50)

Unit 1: Introduction to Parasitology

- 1.1 Concepts and definitions to animal associations with emphasis on parasitology
- 1.2 Origin, evolution and distribution of parasites in animal kingdom
- 1.3 Parasitic adaptations (Morphological, Physiological & Behavioral) & Zoonosis
- 1.4 Host parasite relationships - general account

Unit II: Protozoology

- 2.1 Protistan parasites of Man (Luminal & Blood)
- 2.2 Detailed life cycle, pathogenicity and control of *Entamoeba* & *Leishmania*
- 2.3 Pathogenicity and control of falciparum malaria with special emphasis on immunoprophylaxis
- 2.4 Opportunistic protozoan parasites of man: *Pneumocystis carinii* & *Cryptosporidium parvum*

Unit III: Helminthology

- 3.1 Introduction, general organisation and outline classification of helminths
- 3.2 Trematode parasites of man with life cycle, pathogenicity & control of *Shistosoma*
- 3.3 Cestode parasites of man with life cycle, pathogenicity & control of *Taenia*
- 3.4 Nematode parasites of man with life cycle, pathogenicity & control of *Enterobius*

Suggested Books / Reading Material

1. *Animal Parasitology* by **J. D. Smyth.**
2. *Foundations of Parasitology* by **Gerald D. Schmidt and Larry S. Roberts.**
3. *Foundations of Parasitology* by **Larry S. Roberts, John Janovy and Steve Nadler.**
4. *General parasitology* by **Thomas C. Cheng.**
5. *Georg's parasitology for Veterinarians* by **D. D. Bowman**
6. *Parasitology (Protozoology & Helminthology)* by **K. D. Chatterjee.**
7. *Parasitology* by **Elmer R. Nobel and Glenn A. Noble.**
8. *Parasitology vector biology* by **Marquart, Demaree and Grieve**

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

Course Code: ZO17105DCE

Course Title: **Veterinary Parasitology**

Total Credits: **3** (3 L + 0 T + 0 P)

Maximum Marks: **75** (25 + 50)

Unit I: Protista

- 1.1. Protistan parasites of poultry with special reference to *Eimeria*
- 1.2. Epidemiology, life-cycle, pathogenicity and control of *Trypanosoma* & *Babesia* in cattle
- 1.3. Epidemiology, life-cycle, pathogenicity and control of *Sarcocystis* & *Toxoplasma* in sheep
- 1.4. Host immune response to protozoans

Unit II: Platyhelminths

- 1.1. Trematode and cestode parasites of Fishes with special reference to the morphology, biology and control of *Diplozoon* and *Adenoscolex*
- 1.2. Trematode and cestode parasites of Aves with special reference to life cycle, pathogenicity and control of *Echinostomum* and *Davania*
- 1.3. Trematode and cestode parasites of ruminants with reference to the life cycle, pathogenicity and control of *Dicrocoelium* & *Monezia*
- 1.4. General account of Anthelmintics and Anthelmintic resistance

Unit III: Nematyhelminths and Acanthocephala

- 2.1. Nematode parasites of fishes with special reference to life cycle, pathogenicity and control of *Rhabdochona guptii*
- 2.2. Nematode parasites of Aves with special reference to life cycle, pathogenicity and control of *Heterakis gallinarum*
- 2.3. Nematode parasites of Sheep with special reference to life cycle, pathogenicity and control of *Haemonchus contortus*
- 2.4. Acanthocephalan parasites of fishes with special reference to *Pomphorhynchus kashmiriensis*

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. *Foundations of Parasitology* by **Gerald D. Schmidt and Larry S. Roberts**
5. *General parasitology* by **Thomas C. Cheng**
6. *Foundations of Parasitology* by **Larry S. Roberts, John Janovy and Steve Nadler**
7. *Helminthes Arthropods and Protozoa of Domesticated Animals* by **EJL Soulsby**
8. *Parasitology and Vector Biology* by **William C. Marquardt, Richard S. Demaree and Robert B. Grieve**
9. *Monning's Veterinary Helminthology and Entomology* by **GeoffrengLapage**
10. Besides, the students are asked to visit www.springer & www.biomed for latest advances

Course Code: ZO17106DCE
Total Credits: 2 (0 L + 0 T + 2 P)

Course Title: General Parasitology & Techniques
Maximum Marks: 50

Unit I: General Parasitology

- 1.1 Slide study of protistan parasites: *Entamoeba*, *Balantidium*, & *Leishmani*
- 1.2 Preparation of permanent mounts of parasitic protistans
- 1.3 Slide study of helminth parasites: *Fasciola*, *Taenia*, *Entrobilus* & *Ancylostoma*
- 1.4 Slide study of acanthocephalans
- 1.5 Slide study of arthropods

Unit II: Parasitological Techniques

- 2.1 Methods of collection, fixation and preservation of ecto- and endo-parasites from different hosts viz., fish, fowl, sheep and cattle
- 2.2 Methods of permanent mount preparation of ecto- and endo-parasites recovered from different hosts viz., fish, fowl, sheep and cattle
- 2.3 Faecal, Blood and Urine Examinations for diagnosis of parasitic diseases
- 3.4 Microtomy
- 3.5 Micrometry

Course Code: ZO17001GE

Course Title: Medical and Veterinary Entomology

Total Credits: 2 (2 L + 0 T + 0 P)

Maximum Marks: 50

Unit I: Medical Entomology

- 1.1 General account of insect vectors, mechanical and biological vectors
- 1.2 Insect-borne viral and bacterial diseases of man
- 1.3 Insect-borne protozoan and helminth diseases of man
- 1.4 Insect causing diseases of man– Myiasis (types and causes)

Unit II: Veterinary Entomology

- 2.1 General account of insects of veterinary importance
- 2.2 Insects as vectors of helminthic diseases of domestic animals
- 2.3 Insects as vectors of bacterial and viral diseases of domestic animals
- 2.4 Life-cycle and control of the following major vectors of animal diseases:
 - i. *Tabanus*
 - ii. *Chrysops*

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
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**

Course Code: ZO17002GE

Course Title: **Basics of Wildlife Science**

Total Credits: **2** (2 L + 0 T + 0 P)

Maximum Marks: **50**

Unit I: Wildlife, Mammalogy and Ornithology

- 1.1 Wildlife: Introduction and Importance
- 1.2 Birds and Mammals: Aquatic and Terrestrial adaptations
- 1.3 Distribution of important mammalian taxa in different biogeographical zones of India
- 1.4 Flight adaptations and migration in birds

Unit II: Herpetology, Human-Wildlife Conflict and Wildlife of Jammu & Kashmir

- 2.1 Amphibia: Introduction, Biology of frogs, Parental care
- 2.2 Reptilia: Introduction, Biology of Indian crocodiles, identification of poisonous & non-poisonous snakes
- 2.3 Human- wildlife conflict: Causes, Consequences and its management
- 2.4 An overview of wildlife of Jammu & Kashmir, Status and distribution of wildlife of Jammu & Kashmir

Suggested Books / Reading Material

1. *Wildlife Biology* by Raymond F. Dasmann
2. *Mammalogy* by Nicholas J. Czaplewski, James M. Ryan, Terry A. Vaughan
3. *Handbook of Bird Biology* by Irby J. Lovette and John W. Fitzpatrick
4. *Herpetology: An Introductory Biology of Amphibians and Reptiles* by Laurie J. Vitt
5. *Indian mammals a field guide* by Vivek Menon
6. *Ecology and Field Biology*, **Robert. L. Smith** (1966) Harper & Row Publishers New York
7. *Fundamentals of wildlife Management* -2nd edition) **Rajesh Gopal** (2012) Natraj Publishers, Dehradun India
8. *Wilderness Wildlife* **G. A. Bhat** (2008) Book Vision Hazratbal Srinagar

Course Code: ZO17001OE

Course Title: Fish & Fish Nutrition

Total Credits: 2 (2 L + 0 T+ 0 P)

Maximum Marks: 50

Unit I: Introduction to Pisces

- 1.1. General account on characteristics of Pisces
- 1.2. Adaptations of hill stream fishes
- 1.3. Larvivorous fishes and ornamental fishes
- 1.4. Nest building and parental care in fishes

Unit II: Fish Nutrition

- 2.1 Feeding strategies, Food and Feeding habits of local fishes
- 2.2 Selection of feed ingredients and their proximate composition, Concept of feed formulation, Pearson Square method
- 2.3 Types of Fish feed: Moist feed, Semi-moist feed and dry feed
- 2.4 Probiotics and their use in aquaculture

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
5. Fundamentals of Ichthyology by S.P. Biswas
6. Fish in Nutrition. Eirik Heen and Rudolf Kreuzer, Fish News Book Ltd. FAO 1962 Ludgate House London.
7. Fish Nutrition & Feed Technology. S. Athithan N. Felix & N. Venkatasany. Daya Publishing House, New Delhi 2012.
8. Fish Nutrition in Aquaculture. Y. S. Chandrasekhar Swatik Publication New Delhi 2014.