Choice Based Credit System (CBCS) Scheme for 2nd Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Course Type</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Examinations / Marks</th>
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<tr>
<td>ZO17201CR</td>
<td>Anatomy and Physiology of Mammals</td>
<td>Core</td>
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<td>Ethology and Developmental Biology</td>
<td>Core</td>
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<td>ZO17203CR</td>
<td>Seminar (1 credit) + Practical (3 credits)</td>
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<td>ZO17204DCE</td>
<td>Morphology, Anatomy and Physiology of Fishes</td>
<td>Discipline Centric</td>
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<td>Lab course &amp; Field study</td>
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<td>ZO17003GE</td>
<td>Basic and Applied Entomology</td>
<td>Generic Elective</td>
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<td>Conservation Biology and Wildlife Resource Management</td>
<td>Generic Elective</td>
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<td>ZO17002OE</td>
<td>Parasitology in relation to Public Health</td>
<td>Open Elective</td>
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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.
Unit I: Digestive & Respiratory Systems
   1.1 Structure of digestive system & associated glands
   1.2 Physiology of digestion, absorption, energy balance, BMR
   1.3 Structure of Lungs. Transport & exchange of respiratory gases and regulation of respiration
   1.4 Cell Respiration: Glycolysis, TCA Cycle and ETC

Unit II: Circulatory & Excretory systems
   2.1 Structure and function of heart
   2.2 Structure and functions of blood, haemostasis
   2.3 Ultra-structure of kidney; conducting system
   2.4 Physiology of excretion-urine formation, micturition, regulation of water balance

Unit III: Neuro-Endocrine System
   3.1 Nervous tissue, structure and types of neurons and neuroglia; Physiology of nerve conduction
   3.2 Gross anatomy of brain and spinal cord, peripheral and autonomous nervous system
   3.3 Endocrine glands and their functions
   3.4 Neuro-endocrine regulation and hormonal disorders

Unit IV: Receptor physiology
   4.1 Receptors- general account
   4.2 Gustatory and Olfactory receptors with their physiology
   4.3 Structure and function of ear
   4.4 Structure and function of eye

Suggested Books / Reading Material
1. Animal 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 Tyloret al.
10. Biology Today by Sandra S. Gottfried
11. Comparative Animal Physiology by Philip C. Withers
12. Comparative Physiology by B. T. Scher
14. General & Comparative Physiology by William S. Hour
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
Unit I: Behavioural Development
1.1 Home range, Territoriality, Dispersal and Habitat selection
1.2 Food selection and optimal foraging theory
1.3 Genetic and environmental components in the development of behaviour
1.4 Neural basis of behavior: Stimulus filtering, Biological rhythms

Unit II: Social Behavior and Behavioral Adaptations
2.1 Social organization in insects and primates
2.2 Parental care and nesting habits in birds
2.3 Behavioural adaptations in mammals and birds
2.4 Communication in animals: auditory, visual, chemical and tactile

Unit III: Reproductive and Learning Behaviour
3.1 Courtship and mating systems
3.2 Parental investment and reproductive strategies
3.3 Learning behaviour in vertebrates
3.4 Migration in insects and fishes

Unit IV: Developmental Biology of Birds and Mammals
4.1 Gametogenesis, Fertilization and Cleavage
4.2 Blastulation and implantation of blastocyst (Mammals)
4.3 Extra embryonic foetal membranes – formation, structure and function.
4.4 Natural and artificial parthenogenesis. Significance of parthenogenesis.

Suggested Books / Reading Material
3. Animal Behaviour by Anbery
4. Principles and Animal Development by S. C. Goel
5. Mechanism of Animal Behaviour by Peter Marker and J. Hamilton, Jhon Wiley & Sons USA
6. An introduction to Animal Behaviour by Manning and Dawkins, Cambridge University Press
Course Code: ZO17203CR  
Course Title: **Practicals based on 201CR & 202CR**  
Total Credits: **4 (0 L + 1T* + 3 P)**  
Maximum Marks: **100 (25 + 75)**

**a. Seminar***

**b. List of practicals**

1. Study of histological slides—T. S. of Stomach, Intestine, liver, and lungs
2. Demonstration of enzyme action on starch
3. Determination of blood groups, bleeding time, TLC and DLC of human blood
4. Study of various organ systems through dissection of Rat
5. Study of skeletal elements of Rabbit
6. Study of various endocrine glands through prepared slides
7. Study of various organs of sheep—brain/eye/heart/kidney
8. Study of various types of bird nests
9. Investigation of hydrotaxis, chemotaxis and phototaxis in earthworm
10. Field exercises to study various types of behaviour in animals
11. Study of gametogenesis through prepared slides
12. Study of invertebrate and vertebrate egg specimens (insects, fishes, frog and hen)
13. Study of preserved specimens of human foetus of three trimesters
14. Chick embryology

*Seminar:*

- A Seminar lecture on a topic of Zoological interest, carrying 1 credit, shall be allotted at the start of M. Sc. 2nd semester. The students shall be allotted a teacher under whose supervision they shall have to prepare the seminar lecture. A schedule shall be notified for delivering the seminar lectures by the students to be attended by all students and the faculty.
- The seminar lecture shall carry 20 marks to be evaluated on the basis of three criteria viz., content, presentation and interaction. The seminar lecture shall be evaluated by the concerned teacher and in case the concerned teacher is not present, then the senior most teacher present in the seminar shall evaluate the student.
- 5 marks shall be given on the basis of attendance of the students in all the seminar lectures delivered.
Course Code: ZO17204DCE
Course Title: Morphology, Anatomy and Physiology of Fishes
Total Credits: 3 (3 L + 0 T + 0 P)
Maximum Marks: 75 (25 + 50)

Unit I: Systematics and Morphology
1.1. Outline classification of fishes with distinguishing characters upto principal subdivisions
1.2. General account on adaptive radiation in Elasmobranchii and Actinopterygii
1.3. Structure types and modification of scales
1.4. Structure types and modification of fins

Unit II: Fish Anatomy and Physiology I
2.1. Digestive system and physiology of digestion
2.2. Structure and function of gills
2.3. Structure and function of Heart and blood vessels
2.4. Structure and function of Kidneys (Excretion and Osmoregulation)

Unit III: Fish Anatomy and Physiology II
3.1. Structure and function of nervous system (Teleost)
3.2. Structure and function of Endocrine Organs
3.3. Sense organs and their functions
3.4. Reproductive organs in fishes (Teleost)

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
Unit I: Aquaculture

1.1. Aquaculture criteria and practices, role of aquaculture in food supply, application of biotechnology in aquaculture
1.2. Principle of organic aquaculture, procurement of stocking material for aquaculture
1.3. Site selection, construction and management of fish pond
1.4. Induced breeding in fishes

Unit II: Culture Techniques

2.1. Trout and carp culture
2.2. Brackish water fish culture
2.3. Prawn and pearl culture
2.4. Integrated fish farming, composite/polyculture

Unit III: Fish Nutrition

3.1. Macronutrients: Protein, lipid and carbohydrate requirement of fishes
3.2. Micronutrients: Vitamins and mineral requirement and their deficiency symptoms
3.3. Fish feed ingredients, proximate composition and formulation of fish feed
3.4. Types of fish feed: Moist, semi-moist, dry, crumbles, flakes and micro encapsulated feed

Suggested Books / Reading Material

1. Fish Physiology, Series I-XIV by Hoar and Randall Academic Press
2. The Physiology of Fishes CRC Press by Evans
3. The Physiology of Fishes Vol. I & II Academic Press by Brown
I. Field work

Visit to various local water bodies, fish hatcheries and aquarium for demonstration, study and collection of specimens.

II. List of Laboratory Practicals

1. Study of morphometric and meristic characters of fish
2. Study of fish scales and determination of age
3. Gut content analysis to study feeding habits of fish
4. Dissection of accessory respiratory organs in fishes (Anabas / Clarias / Heteropneustes)
5. Extraction of Weberian ossicles and Otolith from fish
6. Dissection of fish to study internal anatomy
7. Determination of fecundity in fishes (Carps and Schizothorax)
8. To study different organs of fish through histological slides
9. Preparation of temporary and permanent slides of various organs of fishes
10. Estimation of haemoglobin and TLC and DLC
11. Estimation of moisture and ash from fish and available feed ingredients
12. Estimation of protein and fat in fish and available feed ingredients
Course Code: ZO17003GE  
Course Title: Basic and Applied Entomology  
Total Credits: 2 (2 L + 0 T + 0 P)  
Maximum Marks: 50

Unit I: Basic Entomology

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

Unit II: Applied Entomology

2.1 Pheromones-types and uses  
2.2 Insect resistance to chemical pesticides  
2.3 Genetic control of Insects- methods and successful examples  
2.4 Role of IPM in insect pest control

Suggested Books / Reading Material

1. Modern Entomology by D. B. Tembhare Himalaya Publishing House
3. A text book of Applied Zoology by Pradip V. Jabde
Course Code: ZO17004GE          Course Title: Conservation Biology and Wildlife Resource Management
Total Credits: 2 (2 L + 0 T + 0 P)          Maximum Marks: 50

Unit I: Conservation Biology
  1.1 IUCN protected area categories, Marine protected areas
  1.2 Protected area network in India
  1.3 Key stone species: the concept and its relevance for conservation
  1.4 In situ and ex situ conservation

Unit II: Wildlife Resource Management
  2.1 Wildlife Protection Act (1972), its brief structure and recent amendments
  2.2 Wildlife protection act of J & K– An overview
  2.3 Conservation projects in India: Tiger, Hangul and Crocodile
  2.4 Wildlife conventions: Ramsar, Bonn, CITES

Suggested Books / Reading Material
Course Code: ZO17002OE  Course Title: Parasitology in Relation to Public Health
Total Credits: 2 (2 L + 0 T +0 P)  Maximum Marks: 50

Unit I: Introduction to Parasitology
1.1 Introduction to animal associations
1.2 Distribution of parasites in animal kingdom
1.3 Introduction to Protista with special reference to protistan parasites of man in Kashmir valley
1.4 Description, life-cycle, pathogenicity and control of Entamoeba histolytica

Unit II: 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. Parasitology by Elmer R. Noble and Glenn A. Noble
2. Animal Parasitology by J. D. Smyth
3. Parasitology (Protozoology & Helminthology) by K. D. Chatterjee
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

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