Choice Based Credit System (CBCS) Scheme for 4th Semester

Course Code	Course Title	Course Type	Hours / Week			Credits	Examinations / Marks		
			L	T	P		Continuous Assessment I	Continuous Assessment II	Term End Examination
ZO17401CR	**Ecology, Limnology & Biodiversity**	Core	4	0	0	4	25 marks	25 marks	50 marks
ZO17402CR	**Immunology & Biotechnology**	Core	4	0	0	4	25 marks	25 marks	50 marks
ZO17403CR	**Project (3 credits) + National / Local fauna Collection (1 credit)**	Core	0	2	6	1+3	25 marks	-	75 marks
ZO17404DCE	**General Entomology**	Discipline Centric	3	0	0	3	25 marks	-	50 marks
ZO17405DCE	**Insect Ecology & Pest Management**	Discipline Centric	3	0	0	3	25 marks	-	50 marks
ZO17406DCE	**Lab Course and Field Study**	Discipline Centric	0	0	4	2	-	-	50 marks
ZO17007GE	**Medical Helminthology and Immunology**	Generic Elective	2	0	0	2	-	-	50 marks
ZO17008GE	**Fish Biology and Culture Techniques**	Generic Elective	2	0	0	2	-	-	50 marks
ZO17004OE	**Basics of Wildlife Studies**	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.: **Zo17401CR** Course Title: **Ecology, Limnology & Biodiversity**
Total Credits: **4** (4 L + 0 T + 0 P) Maximum Marks: **100** (25 + 25 + 50)

Unit I: Ecosystem Ecology

1.1 Ecosystem: Structure and function; energy flow and mineral cycling (CNP); structure and function of some ecosystems: terrestrial (forest) and aquatic (fresh water)

1.2 Habitat and niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche

1.3 Ecological succession: types; mechanisms; changes involved in succession; concept of climax

1.4 Concepts of bioremediation and biomagnification

Unit II: Population and Community Ecology

2.1 Attributes of population: natality, mortality, life tables, survivorship curves and reproductive rate

2.2 Population growth– Exponential and logistic growth patterns, growth models- (time lag models)

2.3 Life history strategies: r and k selection, clutch size and sex ratio.

2.4 Population regulation– Extrinsic and intrinsic factors.

Unit III: Limnology

3.1 Physicochemical parameters of water bodies

3.2. Eutrophication in Lakes

3.3. Role of Macro and micro-nutrients in water bodies

3.4. Macro zoo-benthos in lakhs

Unit IV: Biodiversity

4.1 Concept and levels of biodiversity: species diversity, genetic diversity and ecosystem diversity; values of biodiversity

4.2 Biodiversity hotspots and loss of biodiversity: causes and factors

4.3 Convention on biological diversity (CBD) and issues under the CBD

4.4 Biological diversity Act, 2002 main provisions and rules

Course No.: **ZO17402CR** Course Title: **Immunology & Biotechnology**
Total Credits: **4** (4 L + 0 T+ 0 P) Maximum Marks: **100** (25 + 25 + 50)

Unit I: Defense Mechanism in Higher Vertebrates

1.1 Innate immunity and Acquired immunity
1.2 Complement system: Classical & Properdin Pathway
1.3 Immuno-deficiency diseases: Stem cell, B & T-cell deficiency diseases
1.4 Tumour Immunology with special emphasis on tumour immunotherapy

Unit II: Damaging and Defective Immune Response

2.1 Concept of hypersensitivity. Classifications of hypersensitivity reactions
2.2 Mechanism of type I and type II hypersensitivity reactions
2.3 General account on autoimmune diseases with special emphasis on auto-immune anaemia's & rheumatoid arthritis
2.4. Transplantation immunology-Homograft rejection

Unit III: Biotechnology in Human welfare-I

3.1. Production & contribution of transgenic animals to human welfare (Poultry & Dairy)
3.2. Modern assisted reproductive techniques in human and cattle
3.3. Application of biotechnology in – (a) Sericulture (b) Apiculture
3.4. rDNA Technology for production of biomolecules

Unit IV: Biotechnology in Human welfare-II

4.1. Cell culture types
4.2. Cell culture media and their types
4.3. Cell culture sterilization techniques
4.4. Gene therapy: Principle: *Ex-vivo* & *In-vivo* gene therapy

Course Code: **ZO17403CR** Course Title: **National / Local fauna Collection (1 credit) + Project (3 credits)**

Total Credits: **4** (0 L + 1 T*+ 3 P) Maximum Marks: **100** (25 + 75)

I. The students shall be allotted a mini project in M. Sc. 3rd Semester by a Teacher to whom he/she shall be assigned. The students shall start the project work right from 3rd semester and by the time they reach 4th semester, they shall have to complete the same and submit the processed collection for the Museum and a report for the perusal of the examiners. This shall carry 3 credits. A brief outline of the projects in different specializations is as under:

   a. Parasitology
   b. Ichthyology
   c. Entomology
   d. Wildlife

II. *In M. Sc. 3rd Semester, the students are provided an opportunity to visit various places of Zoological interest outside the valley/state for fauna collection. All students are required to submit the collected specimens, duly identified, labeled and accompanied with a detailed account. This activity shall earn the students 1 credit. In case a student for a genuine reason is not able to participate in the tour. He/she shall have to collect fauna as assigned by the Department of some area and submit the same for earning the 1 credit.

Course Code: **ZO17404DCE** Course Title: **General Entomology**

Total Credits: **3** (3 L+ 0 T+0 P) Maximum Marks: **75** (25 + 50)

Unit I: Insect Morphology

1.1 Integument– structure and composition
1.2 Head– structure, region, sulci and antennae
1.3 Thorax– structure and appendages
1.4 Abdomen and its modifications

Unit II: Insect Anatomy

1.1 Digestive System
1.2 Respiratory System
1.3 Circulatory System
1.4 Nervous System

Unit III: Insect Physiology

2.1 Physiology of digestion and assimilation
2.2 Physiology of respiration
2.3 Physiology and biochemistry of haemolymph, haemocytes and their function
2.4 Malpighian tubules and formation of uric acid

Suggested Books / Reading Material

1. *The Insects : Structure and Function* by **R. F. Chapman** Cambridge University Press
2. *Physiological Systems in Insects* by **Marc J. Klowden** Academic Press
3. *Modern Entomology* by **D. B. Tembhare** Himalaya Publishing House
4. *Imm's General Text Book of Entomology* vol. I by **O. W. Richards and R.G. Davis** Springer
5. *Entomology* by **Cedric Gillott** Plenum Press, New York
6. Fundamentals of Entomology by **Richard J. Elizinga**
7. Introduction to Entomology by **Comstock**

Course Code: **ZO17405DCE** Course Title: **Insect Ecology and Pest Management**

Total Credits: **3** (3 L+ 0 T + 0 P) Maximum Marks: **75** (25 + 50)

Unit I: Insect Ecology

1.1 Effects of High-altitude environment on morphology, physiology and development of insects

1.2 Effects of temperature, humidity and light on the activities of insects

1.3 Population dynamics

1.4 Insect-plant interaction

Unit II: Economic Entomology

Insect pests with emphasis on the occurrence, economic importance, life cycle and control of only one major pest of the following crops

2.1 Temperate fruits

2.2 Vegetables - brassicas

2.3 Food crops- Paddy, Wheat and Maize

2.4 Stored grains

Unit III: Insect Pest Management

3.1 Cultural control of insects– principles, methods and techniques with examples

3.2 Chemical insecticides–organochlorines and organophosphates

3.3 Biological control with successful examples of parasites/parasitoids and predators

3.4 IPM: Concept, strategies and tools in pest management

Suggested Books / Reading Material

1. *A text book of Applied Zoology* by **Pradip V. Jabde**
2. *A text book of Applied Entomology –vol. II* by **K.P. Srivastava** Kalyani Publishers
3. *Entomology* by **Cedric Gillott** Plenum Press, New York
4. Fundamentals of Entomology by **Richard J. Elizinga**
5. Introduction to Entomology by **Comstock**
6. *Modern Entomology* by **D. B. Tembhare** Himalaya Publishing House

Course Code: **ZO17406DCE** Course Title: **Lab Course and Field Study**
Total Credits: **2** (0 L + 0 T +2 P) Maximum Marks: **50**

I. Field work

Field study cum insect collection trip to high altitude ecosystems

II. List of Laboratory Practicals

1. Specimen study of the following insects

   Grasshopper, Cricket, Cockroach, Nepa, Rice bug, Aphid, Thrips, Cabbage butter fly, Luna moth, Silk moth, Carpenter bee, Honey bee, Wasp, House fly, Mosquito and Fleas
2. Permanent whole mount preparation of the following insects: Aphids, Sucking lice, Mosquitoes
3. Minor dissection / temporary mount preparation of head, mouth parts, wings, spiracles, genitalia, pretarsus and legs of the following: Grasshopper, Housefly and Mosquito
4. Major dissections: Digestive, Respiratory and Nervous system of Grasshopper, Cricket and Cockroach
5. Isolation and temporary mount preparation of malpighian tubules of Grasshopper
6. Minor dissection / temporary mount preparation of trachea and salivary glands of Grasshopper
7. Study of haemocytes in insects
8. Permanent mount preparation of Arista and Haltares

Course Code**: ZO17007GE** Course Title**: Medical Helminthology and Immunology**
Total Credits: **2** (2 L + 0 T + 0 P) Maximum Marks: **50**

Unit I: Medical Helminthology

1.1 Cestode parasites of man with reference to life-cycle, pathogenicity and control of *Taenia saginata*

1.2 Trematode parasites of man with special reference to life-cycle, pathogenicity and control of *Schistosoma haematobium*

1.3 Nematode parasite of man with special emphasis on description, life- cycle, pathogenicity and control of *Enterobius vermicularis*

1.4 Anthelmintics – general account

Unit II: Immunology

2.1 Introduction to immune system

2.2 Immunodeficiency diseases

2.3 Hypersensitivity reactions; Mechanism of cytotoxic reactions

2.4 Autoimmune diseases: Autoimmune anaemia & Rheumatoid arthritis

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. *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

Course Code**: ZO17008GE** Course Title**: Fish Biology and Culture Techniques**

Total Credits: **2** (2 L + 0 T+ 0 P) Maximum Marks: **50**

Unit I: Fish Biology

1.1. Importance of Fish Biology in rational exploitation of Fishery resources

1.2. A general account on breeding cycle and spawning

1.3. Fecundity in fishes

1.4. Nest building and parental care in fishes

Unit II: Culture Techniques

2.1. Trout culture

2.2. Carp culture

2.3. Composite fish culture

2.4. Integrated fish farming

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=3.
9. Biology of Fishes by Bone & Moore.
10. Aquaculture – Principles & Practices by T. V. R. Pillay.
11. Studies in freshwater fishery biology by Lagler.

Course Code: **ZO17004OE** Course Title: **Basics of Wildlife Studies**

Total Credits: **2** (2 L+ 0 T +0 P) Maximum Marks: **50**

Unit I: Wildlife of India

1.1 Wildlife: Introduction and importance

1.2 Types of protected areas in India, threats to wildlife habitats of India

1. 3 Wildlife Protection Act (1972), its brief structure and recent amendments

1.4 Conservation projects in India: Tiger, Hangul & Crocodile

Unit II: Wildlife of J & K

2.1 Wildlife of Jammu & Kashmir- An overview

2.2 Status and distribution of Tibetan antelope, Hangul deer and Markhor

2.3 Wetlands: Introduction, importance, threats and management

2.4 Man– animal conflict: causes, consequences and its management

Suggested Books / Reading Material

1. *Fundamentals of wildlife Management* -2nd edition) **Rajesh Gopal** (2012) Natraj
2. Publishers, Dehradun India
3. **Wilderness WildlifeG. A. Bhat** (2008) Book Vision Hazratbal Srinagar
4. *Wildlife in India*, **V. B. saharia** (1982) Natraj Publishers Dehradun
5. www.jkwildlife.com