

**P. G. Department of Zoology**  
**syllabus**  
**University of Kashmir, Srinagar**  
**3<sup>rd</sup> Semester**

**M.Sc**

5. *Entomology* by **Cedric Gillott** Plenum Press, New York
6. *Fundamentals of Entomology* by **Richard J. Elizinga**
7. *Introduction to Entomology* by **Comstock**

**ZOO-304-DCE:**

**VETERINARY AND AGRICULTURAL NEMATODOLOGY**

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: VETERINARY NEMATODOLOGY & ACANTHOCEPHALA**

- 1.1 Nematode parasites of fishes with special reference to life cycle, pathogenicity and control of *Rhabdochona guptii*
- 1.2 Nematode parasites of Aves with special reference to life cycle, pathogenicity and control of *Heterakis gallinarum*
- 1.3 Nematode parasites of Sheep with special reference to life cycle, pathogenicity and control of *Haemonchus contortus*
- 1.4 Acanthocephalan parasites of fishes with special reference to *Pomphorhynchus kashmiriensis*

**UNIT II: AGRICULTURAL NEMATODOLOGY**

- 2.1 Introduction to plant parasitic nematodes with special reference to pathogenicity and control of *Meloidogyne* and *Heterodera*
- 2.2 Introduction to entomopathogenic nematodes
- 2.3 Plant resistance to phytoparasitic nematodes
- 2.4 Management and control of plant parasitic nematodes

**UNIT III: PRACTICAL WORK**

- 3.1 Study of prepared slides/ specimens of nematode and acanthocephalan parasites of animals
- 3.2 Collection, preservation and preparation of permanent mounts of trematodes and cestodes collected from fishes
- 3.3 Collection, preservation and preparation of permanent mounts of trematodes and cestodes collected from domestic fowl
- 3.4 Collection, preservation and preparation of permanent mounts of trematodes and cestodes collected from ruminant gut
- 3.5 Methods of extraction of nematodes from soil

**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**

**P. G. Department of Zoology**  
**syllabus**  
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**M.Sc**

**ZOO-305-DCE: LIMNOLOGY AND INLAND FISHERIES**

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: LIMNOLOGY**

- 1.1 A general account on high altitude lakes of Jammu and Kashmir; eutrophication in valley lakes
- 1.2 Fate of heat in water: thermal stratification
- 1.3 Macro and micro nutrients in water bodies
- 1.4 Biological communities in inland water bodies (planktonic and benthic)

**UNIT II: INLAND FISHERIES**

- 2.1 Riverine fisheries– ecology and effects of dams
- 2.2 Cold water fisheries– present status and scope for development
- 2.3 Reservoir fisheries– ecology, development, exploitation and management
- 2.4 Estuarine Fisheries– present status, potential and management

**UNIT III: PRACTICALS**

- 3.1 Determination of temperature, pH and transparency of water bodies
- 3.2 Determination of dissolved oxygen, free carbon dioxide, total alkalinity of water bodies/ water sample
- 3.3 Qualitative and quantitative analysis of zooplankton local water bodies
- 3.4 Permanent slide preparation of planktons from local water bodies
- 3.5 General characters and classification of important riverine, reservoir and estuarine fishes

**SUGGESTED BOOKS/READING MATERIAL**

1. *Textbook of Limnology* by **Goldman and Horne** McGraw Hill Higher Education
2. *Limnology: Lake and River Ecosystems* by **Robert G. Wetzel** Academic Press
3. *Fundamentals of Limnology* by **Arvind Kumar** Ashish Publishing House
4. *Advances in Limnology* by **H.R. Singh** Narendra Publishing House
5. *Fish and Fisheries of India* by **V. G. Jhingram** Hindustan Publishing Corporation
6. *Ecology and Field Biology* by **Robert Leo Smith** Harper & Row, Publisher

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**syllabus**  
**University of Kashmir, Srinagar**  
**3<sup>rd</sup> Semester**

**M.Sc**

**ZOO-306-DCE: ECONOMIC 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: AGRICULTURAL ENTOMOLOGY**

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

- 1.1 Vegetables-brassicas
- 1.2 Food crops- Paddy, Wheat and Maize
- 1.3 Stored-grains
- 1.4 Fodder and Forage

**UNIT II: HORTICULTURAL AND FOREST 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 (Pome and Stone)
- 2.2 Forest pests
- 2.3 Salix and poplars
- 2.4 General polyphagous pests– Locusts, termites and aphids

**UNIT III: PROJECT WORK**

A survey project related to economic entomology (agricultural, horticultural and silvicultural) will be allotted to each student which is mandatory and has to be submitted by the student up to the end of August.

**SUGGESTED BOOKS/READING MATERIAL**

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

**P. G. Department of Zoology**  
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**M.Sc**

**ZOO-307-DCE: CONSERVATION BIOLOGY, ECOTOURISM AND CAPTIVE BREEDING**  
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: CONSERVATION BIOLOGY**

- 1.1 IUCN protected area categories, Marine protected areas, Transfrontier Protected areas
- 1.2 Important National parks, Sanctuaries and Biosphere reserves of India and their characteristic wildlife
- 1.3 Minimum viable populations, Conservation of rare and key stone species
- 1.4 In situ and ex situ conservation, gene banking

**UNIT 2: ECOTOURISM AND CAPTIVE BREEDING**

- 2.1 Ecotourism development in India
- 2.2 Ecotourism potential of wildlife habitats of Jammu and Kashmir
- 2.3 Captive breeding: procedures and requirements
- 2.4 Captive breeding programs in India

**UNIT III: PROJECT WORK**

A project related to the following topics/parameters will be allotted to each student which is mandatory and has to be submitted by the student up to the end of August:

1. Important wildlife issues
2. Conservation status of important mammals and birds
3. Mammal and bird diversity of important habitats of J & K
4. Anthropogenic interferences in wildlife habitats

**SUGGESTED BOOKS/READING MATERIAL**

1. *Fundamentals of wildlife Management* -2<sup>nd</sup> edition) **Rajesh Gopal** (2012) Natraj Publishers, Dehradun India
2. *Wilderness Wildlife* **G. A. Bhat** (2008) Book Vision Hazratbal Srinagar



**P. G. Department of Zoology**  
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**University of Kashmir, Srinagar**  
**3<sup>rd</sup> Semester**

**M.Sc**

3. *The Book of Indian Reptiles*, **Daniel J.C.** (1983) Bombay Natural History Society, Bombay
4. *Reptiles and Amphibians*, **Richard Oulahan** 1977 Time-Life Films, Inc. USA
5. *The Life of Vertebrates*, **Young J. Z.** (1962) Oxford University Press London
6. *Biology and Comparative Physiology of Birds* **A. J. Marshall** (1961) Academic Press, New York

**ZOO-308-GE: CLINICAL PARASITOLOGY AND IMMUNOLOGY**

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: CLINICAL PARASITOLOGY**

- 1.1 Coprological examination techniques
- 1.2 Blood and urine examination techniques
- 1.3 Histological techniques in parasitology
- 1.4 Culture of parasite; eggs and larvae

**UNIT II: IMMUNOLOGY**

- 2.1 Introduction about immune system
- 2.2 Immunodeficiency diseases
- 2.3 Hypersensitivity reactions; Mechanism of cytotoxic reactions
- 2.4 Autoimmune diseases: Autoimmune anaemia & Systemic lupus erythromatosis

**UNIT III: PRACTICAL WORK**

- 3.1 Examination of faecal samples of animals for diagnosis of helminth diseases
- 3.2 Examination of blood of certain vertebrate hosts for the presence of parasites
- 3.3 Microtomy of helminth parasites
- 3.4 Micrometry
- 3.5 Demonstration of antigen-antibody reaction through Haem-agglutination

**SUGGESTED BOOKS/READING MATERIAL**

1. *Immunology* by **Kuby, J., Goldsby, R., Kindt, T.J. and Osbourne, B.A., W.H. Freeman**
2. *Medical Immunology for Students* by **Playfair, J.H.L. and Lydyard, P.M. Churchill**

**P. G. Department of Zoology**  
**syllabus**  
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**4<sup>th</sup> Semester**

**M.Sc**

5. *Wildlife in India* by V. B. Saharia
6. *Managing our Wildlife Resources* by S. A. Anderson
7. *Manual of Wildlife Techniques for India* by Sale and Berkmuller
8. *Concepts in Wildlife Management* by B.B. Hosti
9. *Fundamentals of Wildlife Management* by Rajesh Gopal Natraj Publishers, Dehradun India
10. *Important Bird Areas of Jammu and Kashmir* by A. R. Rahmani, Khurshid A., I. Suhail, P. Chandan and Ashfaq A. Zarri
11. *Biodiversity Perception Pearl and Preservation* by Maiti and Maiti
12. *Biogeography*, Fourth Edition by Mark V. Lomolino, Brett R. Riddle, Robert J. Whittaker, James H. Brown (2010) Sinauer Associates, Inc.; Fourth edition
13. *Zoogeography: The Geographic Distribution of Animals*, Philip J. Darlington (1957)
14. *Basics of Wildlife Health Care and Management*, Rajesh Jani (2012) Narendra Publishing House Delhi
15. *An Introduction to Applied Biogeography* Ian F. Spellerberg, John W. D. Sawyer (1999) Cambridge University Press

**ZOO-404-DCE: PARASITOLOGY AND IMMUNOLOGY**

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: COMPLIMENT SYSTEM**

- 1.1. Proteins of the classical complement pathway.
- 1.2. The sequence of reactions & regulation of complement activity.
- 1.3. Proteins of properdin pathway.
- 1.4. Regulation of properdin pathway.

**UNIT II: DAMAGING AND DEFECTIVE IMMUNE SYSTEM**

- 2.1 Types of hypersensitivity reactions
- 2.2 Mechanism of type I and type II hypersensitivity reactions
- 2.3 Introduction to autoimmunity: Theories of breakdown in self-tolerance
- 2.4 Classification of autoimmune diseases with some important examples

**UNIT III: PROJECT WORK**

A survey project will be allotted to each student for visiting different places like fish farms, poultry farms, sheep farms, grazing fields, high altitude pastures etc. for collection of vectors, parasites and eggs; which are mandatory and have to be submitted at the end of the semester.

**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
6. *General parasitology* by Thomas C. Cheng
7. *Foundations of Parasitology* by Larry S. Roberts, John Janovy and Steve Nadler
8. *Immunology* by Kuby, J., Goldsby, R., Kindt, T.J. and Osbourne, B.A., W.H. Freeman
9. *Medical Immunology for Students* by Playfair, J.H.L. and Lydyard, P.M. Churchill

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**4<sup>th</sup> Semester**

**M.Sc**

10. *Immunology* by **Roitt, I.M., Brostoff, J. and Male, D.** Mosby
11. *Basic Immunology* by **Sharon, J. William and Wilkins**
12. *Immunology* by **P. M. Lydyard, A. Whelan And M. W. Fanger**

**ZOO-405-DCE: FISH BIOLOGY AND CULTURE TECHNIQUES**

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: FISH BIOLOGY**

- 1.1 Methods of fishing: Fish nets and gears with special emphasis on local fishing gears and nets
- 1.2 Estimation of fish population, population structure and dynamics
- 1.3 Age determination: Length frequency analysis, model progression methods, growth check, scale and otoliths
- 1.4 Fish migration and types of migration (European eel, Atlantic salmon and Hilsa)

**UNIT II: CULTURE TECHNIQUES**

- 2.1 Trout and carp culture
- 2.2 Prawn and pearl culture
- 2.3 Brackish water fish culture
- 2.4 Integrated fish farming, Composite/ Polyculture in fishes

**UNIT III: PROJECT WORK**

A survey project related to identification, culture, reproduction, feeding, limnology and population of fishes along with pathological, nutritional and biochemical parameters will be allotted to each student which is mandatory and have to be submitted by the students at the end of the semester.

**SUGGESTED BOOKS/READING MATERIAL**

1. A Text Book of Fish Biology & Fisheries by **S S Khanna and H R Singh** Narendra Publishing House
2. An Introduction to Fishes by **H.S. Bhamrah, Kavita Juneja** Anmol Publications Pvt Ltd
3. Fish and Fisheries by **Yadav, B N** Daya Publishing House
4. Fishes: An Introduction to Ichthyology by **Peter B. Moyle Joseph J. Cech Jr.**, Prentice Hall India Learning Private Limited
5. Aquaculture - Principles and Practices by **T. V. R. Pillay** Wiley-Blackwell; New edition edition
6. Fish and Fisheries of India by **V. G. Jhingram** Hindustan Publishing Corporation

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**4<sup>th</sup> Semester**

**M.Sc**

10. *Immunology* by **Roitt, I.M., Brostoff, J. and Male, D.** Mosby
11. *Basic Immunology* by **Sharon, J. William and Wilkins**
12. *Immunology* by **P. M. Lydyard, A. Whelan And M. W. Fanger**

**ZOO-405-DCE: FISH BIOLOGY AND CULTURE TECHNIQUES**

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: FISH BIOLOGY**

- 1.1 Methods of fishing: Fish nets and gears with special emphasis on local fishing gears and nets
- 1.2 Estimation of fish population, population structure and dynamics
- 1.3 Age determination: Length frequency analysis, model progression methods, growth check, scale and otoliths
- 1.4 Fish migration and types of migration (European eel, Atlantic salmon and Hilsa)

**UNIT II: CULTURE TECHNIQUES**

- 2.1 Trout and carp culture
- 2.2 Prawn and pearl culture
- 2.3 Brackish water fish culture
- 2.4 Integrated fish farming, Composite/ Polyculture in fishes

**UNIT III: PROJECT WORK**

A survey project related to identification, culture, reproduction, feeding, limnology and population of fishes along with pathological, nutritional and biochemical parameters will be allotted to each student which is mandatory and have to be submitted by the students at the end of the semester.

**SUGGESTED BOOKS/READING MATERIAL**

1. A Text Book of Fish Biology & Fisheries by **S S Khanna and H R Singh** Narendra Publishing House
2. An Introduction to Fishes by **H.S. Bhamrah, Kavita Juneja** Anmol Publications Pvt Ltd
3. Fish and Fisheries by **Yadav, B N** Daya Publishing House
4. Fishes: An Introduction to Ichthyology by **Peter B. Moyle Joseph J. Cech Jr.**, Prentice Hall India Learning Private Limited
5. Aquaculture - Principles and Practices by **T. V. R. Pillay** Wiley-Blackwell; New edition edition
6. Fish and Fisheries of India by **V. G. Jhingram** Hindustan Publishing Corporation

**P. G. Department of Zoology**  
**syllabus**  
**University of Kashmir, Srinagar**  
**4<sup>th</sup> Semester**

**M.Sc**

**ZOO-406-DCE: INSECT PEST MANAGEMENT**

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: CHEMICAL CONTROL**

- 1.1 Chemical insecticides– organochlorines and organophosphates
- 1.2 Insecticides of plant origin
- 1.3 Insect chemosterilization– types of chemosterilants and mode of action
- 1.4 Mode of action of insecticides

**UNIT II: CULTURAL, BIOLOGICAL AND LEGISLATIVE CONTROL**

- 2.1 Cultural control of insects– principles, methods and techniques with examples
- 2.2 Biological control with successful examples of parasites/parasitoids and predators
- 2.3 Microbial control of insect pests
- 2.4 Legislative control (quarantine regulation)

**UNIT III: PHEROMONES, INSECT RESISTANCE AND PEST MANAGEMENT**

- 3.1 Pheromones– types and uses
- 3.2 Insect resistance to chemical pesticides
- 3.3 Genetical control of insects– methods and successful examples
- 3.4 IPM: Concept, strategies and tools in pest management

**SUGGESTED BOOKS/READING MATERIAL**

- 1. *A text book of Applied Entomology –vol. I* by **K.P. Srivastava** Kalyani Publishers
- 2. *Modern Entomology* by **D. B. Tembhare** Himalaya Publishing House

**P. G. Department of Zoology**  
**syllabus**  
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**4<sup>th</sup> Semester**

**M.Sc**

3. *Handbook of Entomology* by **M.R. Dhingra**
4. *A Text book of Entomology* by **R. Mathur**

**ZOO-407-DCE: CONSERVATION GENETICS, TECHNIQUES AND METHODS OF WILDLIFE STUDY**

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: CONSERVATION GENETICS**

- 1.1 Genetic diversity– gene frequencies in populations and loss of genetic diversity
- 1.2 Molecular techniques (protein electrophoresis, mt. DNA & PCR, analyses and comparisons of mitochondrial DNA's) for studying genetic diversity in the wild
- 1.3 Pedigree analysis, inbreeding and out breeding depressions
- 1.4 Non-invasive techniques in wildlife conservation

**UNIT II: TECHNIQUES AND PRACTICES**

- 2.1 Remote sensing: Principles and applications
- 2.2 Geographic information system and its application in wildlife
- 2.3 Use of radio-transmitters in wildlife study
- 2.4 Environmental impact assessment: purpose and procedure

**UNIT III: METHODS OF STUDYING WILDLIFE**

- 3.1 Methods of studying wildlife census
- 3.2 Capture of wildlife: live trapping, mist netting, rocket netting
- 3.3 Chemical capture of wild animals: equipments, drugs and plan of operation
- 3.4 Bird ringing and migration study

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**4<sup>th</sup> Semester**

**M.Sc**

3. *Handbook of Entomology* by **M.R. Dhingra**
4. *A Text book of Entomology* by **R. Mathur**

**ZOO-407-DCE: CONSERVATION GENETICS, TECHNIQUES AND METHODS OF WILDLIFE STUDY**

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)

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- 1.1 Genetic diversity– gene frequencies in populations and loss of genetic diversity
- 1.2 Molecular techniques (protein electrophoresis, mt. DNA & PCR, analyses and comparisons of mitochondrial DNA's) for studying genetic diversity in the wild
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- 3.4 Bird ringing and migration study



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**4<sup>th</sup> Semester**

**M.Sc**

**SUGGESTED BOOKS/READING MATERIAL**

1. *Wildlife Ecology and Management* by Bolen and Robinson
2. *Animal Ecology and Distribution of Animals* by Rastogi and Jayaraj
3. *Indian mammals a field guide* by Vivek Menon
4. *Wildlife in India* by V. B. Saharia
5. *Managing our Wildlife Resources* by S. A. Anderson
6. *Manual of Wildlife Techniques for India* by Sale and Berkmuller
7. *Concepts in Wildlife Management* by B.B. Hosti
8. Remote Sensing and Image Interpretations , Lillesand, T.M.; Kiefer, R.W.; Chipman, J.W. (2004) John wiley and Sons, Inc
9. Manual of Wildlife Techniques for India, J. B. Sale and K. Berkmuller (1988) WII, Dehradun India

**ZOO-408-GE: APPLIED ENTOMOLOGY AND PEST MANAGEMENT**

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: APPLIED ENTOMOLOGY**

- 1.1 Insects as pollinators– general account
- 1.2 Role of insects in medicine and forensic science
- 1.3 Insects in industry– Sericulture and Apiculture
- 1.4 Insects as biocontrol agents

**UNIT II: INSECT PEST MANAGEMENT**

- 2.1 Cultural control of insect pests
- 2.2 Role of IPM in insect pest control
- 2.3 Legislative control of insects
- 2.4 Insecticides of plant origin

**UNIT III: PRACTICAL WORK**

- 3.1 Collection and identification of major insect pests damaging economically important crops and fruits in Kashmir

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

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*
11. Besides, the students are asked to visit [www.springer](http://www.springer) & [www.biomed](http://www.biomed) for latest advances

**ZOO-105-DCE: FISH ANATOMY AND REPRODUCTION**

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

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2. *Fish Physiology: Fish Biomechanics* by **Shadwick & Lauder** Academic Press
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4. *Ichthyology: The study of Fishes* by **Karl F. Lagler, John E. Bardach & Robert R. Miller** John Wiley & Sons, Inc., New York
5. *Fish Physiology. Volume I & II* by **W. S. Hoar & D. J. Randall** Academic Press
6. *Anatomy of Fishes Part-I* by **Wilhelm Harder E. Schweizerbart'sche** Verlagsbuchhandlung Stuttgart
7. *Fish and Fisheries* by **Pandey and Shukla** Rostogi Publication
8. *Fisheries: An Introduction to Ichthyology* by **Peter B. Moyle & Joseph J. Cech, Jr** Prentice Hall, Upper Saddle River, NJ 0458

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

4. *Ichthyology: The study of Fishes* by **Karl F. Lagler, John E. Bardach & Robert R. Miller** John Wiley & Sons, Inc., New York
5. *Fish Physiology. Volume I & II* by **W. S. Hoar & D. J. Randall** Academic Press
6. *Anatomy of Fishes Part-I* by **Wilhelm Harder E. Schweizerbart'sche** Verlagsbuchhandlung Stuttgart
7. *Fish and Fisheries* by **Pandey and Shukla** Rostogi Publication
8. *Fisheries: An Introduction to Ichthyology* by **Peter B. Moyle & Joseph J. Cech, Jr** Prentice Hall, Upper Saddle River, NJ 0458

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)

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**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**
6. *Handbook of Entomology* by **M.R. DHINGRA**
7. *A Text book of Entomology* by **R. Mathur**
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)



**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**
6. *Handbook of Entomology* by **M.R. DHINGRA**
7. *A Text book of Entomology* by **R. Mathur**
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)

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- 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**

- 1. *Indian Mammals* - A Field guide, **Menon, V.** (2014) Hacette Book Publishing Pvt. Ltd. India
- 2. *Biology and Comparative Physiology of Birds*, **Marshall A. J.** (1961) Academic Press, New York
- 3. *The Life of Vertebrates*, **Young J. Z.** (1962) Oxford University Press London
- 4. *The Book of Indian Reptiles*, **Daniel J.C.** (1983) Bombay Natural History Society, Bombay
- 5. *Reptiles and Amphibians*, **Richard Oulahan** 1977 Time-Life Films, Inc.USA

ZOO-108-GE: **AQUACULTURE AND FISH PROCESSING TECHNOLOGY**  
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 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

**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

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](http://www.springer) & [www.biomed](http://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)

**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

**SUGGESTED BOOKS/READING MATERIAL**

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**

**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
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**2<sup>nd</sup> Semester**

**M. Sc**

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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.]

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**SUGGESTED BOOKS/READING MATERIAL**

**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

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



**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

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
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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.]

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**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

- 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 1: 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 *Entrobis vermicularis*

**P. G. Department of Zoology**  
**syllabus**  
**University of Kashmir, Srinagar**  
**3<sup>rd</sup> Semester**

**M.Sc**

3. *The Book of Indian Reptiles*, **Daniel J.C.** (1983) Bombay Natural History Society, Bombay
4. *Reptiles and Amphibians*, **Richard Oulahan** 1977 Time-Life Films, Inc. USA
5. *The Life of Vertebrates*, **Young J. Z.** (1962) Oxford University Press London
6. *Biology and Comparative Physiology of Birds* **A. J. Marshall** (1961) Academic Press, New York

**ZOO-308-GE: CLINICAL PARASITOLOGY AND IMMUNOLOGY**

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: CLINICAL PARASITOLOGY**

- 1.1 Coprological examination techniques
- 1.2 Blood and urine examination techniques
- 1.3 Histological techniques in parasitology
- 1.4 Culture of parasite; eggs and larvae

**UNIT II: IMMUNOLOGY**

- 2.1 Introduction about immune system
- 2.2 Immunodeficiency diseases
- 2.3 Hypersensitivity reactions; Mechanism of cytotoxic reactions
- 2.4 Autoimmune diseases: Autoimmune anaemia & Systemic lupus erythromatosis

**UNIT III: PRACTICAL WORK**

- 3.1 Examination of faecal samples of animals for diagnosis of helminth diseases
- 3.2 Examination of blood of certain vertebrate hosts for the presence of parasites
- 3.3 Microtomy of helminth parasites
- 3.4 Micrometry
- 3.5 Demonstration of antigen-antibody reaction through Haem-agglutination

**SUGGESTED BOOKS/READING MATERIAL**

1. *Immunology* by **Kuby, J., Goldsby, R., Kindt, T.J. and Osbourne, B.A., W.H. Freeman**
2. *Medical Immunology for Students* by **Playfair, J.H.L. and Lydyard, P.M. Churchill**

**P. G. Department of Zoology**  
**syllabus**  
**University of Kashmir, Srinagar**  
**3<sup>rd</sup> Semester**

**M.Sc**

3. *Immunology* by **Roitt, I.M., Brostoff, J. and Male, D.** Mosby
4. *Basic Immunology* by **Sharon, J. William and Wilkins**
5. *Immunology* by **P. M. Lydyard, A. Whelan And M. W. Fanger**
6. *Immunology* by **F. M. Burnet**

**ZOO-309-GE: CONSERVATION BIOLOGY AND WILDLIFE RESOURCE MANAGEMENT**

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: CONSERVATION BIOLOGY**

- 1.1 IUCN protected area categories, Marine protected areas, Transfrontier Protected areas
- 1.2 Protected area network in India
- 1.3 Minimum viable populations, conservation of rare and key stone species
- 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
- 2.4 Wildlife conventions and organizations: Ramsar, Bonn, CITES, IUCN, WWF, BNHS

**UNIT III: PRACTICAL WORK**

- 3.1 Visit to important wildlife habitats of J & K to study different habitat aspects and to identify the animals in the field
- 3.2 Study of species diversity by various methods
- 3.3 Study of vegetation by quadrat method to determine frequency, density, abundance and distribution pattern

**P. G. Department of Zoology**  
**syllabus**  
**University of Kashmir, Srinagar**  
**4<sup>th</sup> Semester**

**M.Sc**

**SUGGESTED BOOKS/READING MATERIAL**

1. *Wildlife Ecology and Management* by Bolen and Robinson
2. *Animal Ecology and Distribution of Animals* by Rastogi and Jayaraj
3. *Indian mammals a field guide* by Vivek Menon
4. *Wildlife in India* by V. B. Saharia
5. *Managing our Wildlife Resources* by S. A. Anderson
6. *Manual of Wildlife Techniques for India* by Sale and Berkmuller
7. *Concepts in Wildlife Management* by B.B. Hosti
8. Remote Sensing and Image Interpretations , Lillesand, T.M.; Kiefer, R.W.; Chipman, J.W. (2004) John wiley and Sons, Inc
9. Manual of Wildlife Techniques for India, J. B. Sale and K. Berkmuller (1988) WII, Dehradun India

**ZOO-408-GE: APPLIED ENTOMOLOGY AND PEST MANAGEMENT**

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: APPLIED ENTOMOLOGY**

- 1.1 Insects as pollinators– general account
- 1.2 Role of insects in medicine and forensic science
- 1.3 Insects in industry– Sericulture and Apiculture
- 1.4 Insects as biocontrol agents

**UNIT II: INSECT PEST MANAGEMENT**

- 2.1 Cultural control of insect pests
- 2.2 Role of IPM in insect pest control
- 2.3 Legislative control of insects
- 2.4 Insecticides of plant origin

**UNIT III: PRACTICAL WORK**

- 3.1 Collection and identification of major insect pests damaging economically important crops and fruits in Kashmir

**P. G. Department of Zoology**  
**syllabus**  
**University of Kashmir, Srinagar**  
**4<sup>th</sup> Semester**

**M.Sc**

- 3.2 Study of biological control agents viz. parasites/ parasitoids and predators on economically important insect pests
- 3.3 Permanent mount preparation of important biocontrol agents (Parasitoids)
- 3.4 Stock solution preparation of various botanicals viz. *Artemisia* sp. and *Datura* sp.
- 3.5 Study of leg modifications of honey bees

**SUGGESTED BOOKS/READING MATERIAL**

- 1. *A text book of Applied Entomology –vol.I & II* by **K.P. Srivastava** Kalyani Publishers
- 2. *Modern Entomology* by **D. B. Tembhare** Himalaya Publishing House
- 3. *Handbook of Entomology* by **M.R. Dhingra**
- 4. *A Text book of Entomology* by **R. Mathur**

**ZOO-409-GE: FISH ECOLOGY AND LIMNOLOGY**

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: ECOLOGY**

- 1.1 Adaptation in Hill stream fishes
- 1.2 Adaptation in deep sea and cave dwelling fishes
- 1.3 Cold adaptation; Freeze tolerance
- 1.4 Fish migration and types of migration (European eel, Atlantic salmon and Hilsa)

**UNIT II: LIMNOLOGY**

- 2.1 High altitude lakes of Jammu and Kashmir– general account
- 2.2 Eutrophication in valley lakes
- 2.3 Macro and micro nutrients in water bodies
- 2.4 Planktonic and benthic communities in inland water bodies

- 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**

- 1. *Indian Mammals* - A Field guide, **Menon, V.** (2014) Hacette Book Publishing Pvt. Ltd. India
- 2. *Biology and Comparative Physiology of Birds*, **Marshall A. J.** (1961) Academic Press, New York
- 3. *The Life of Vertebrates*, **Young J. Z.** (1962) Oxford University Press London
- 4. *The Book of Indian Reptiles*, **Daniel J.C.** (1983) Bombay Natural History Society, Bombay
- 5. *Reptiles and Amphibians*, **Richard Oulahan** 1977 Time-Life Films, Inc.USA

ZOO-108-GE: **AQUACULTURE AND FISH PROCESSING TECHNOLOGY**  
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 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**

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** CRC publication
4. *Fish And Fisheries* by **B.N. Yadav** Daya Publishing House
5. *The Chemical Biology of Fishes* by **R. Malcolm Love** 1970 & 1980 Academic Press Inc.
6. *Industrial Fishery Technology* by **Maurice E. Stansby & John A. Dasso** Reinhold Publishing Corporation  
Chapman & Hall London
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

**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

- 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 1: 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 *Entrobis vermicularis*

**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

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*, *Entrobilus* & *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](http://www.springer) & [www.biomed](http://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: MAMMALOGY 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.

**P. G. Department of Zoology**  
**syllabus**  
**University of Kashmir, Srinagar**  
**3<sup>rd</sup> Semester**

**M.Sc**

3. *Immunology* by **Roitt, I.M., Brostoff, J. and Male, D.** Mosby
4. *Basic Immunology* by **Sharon, J. William and Wilkins**
5. *Immunology* by **P. M. Lydyard, A. Whelan And M. W. Fanger**
6. *Immunology* by **F. M. Burnet**

**ZOO-309-GE: CONSERVATION BIOLOGY AND WILDLIFE RESOURCE MANAGEMENT**

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: CONSERVATION BIOLOGY**

- 1.1 IUCN protected area categories, Marine protected areas, Transfrontier Protected areas
- 1.2 Protected area network in India
- 1.3 Minimum viable populations, conservation of rare and key stone species
- 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
- 2.4 Wildlife conventions and organizations: Ramsar, Bonn, CITES, IUCN, WWF, BNHS

**UNIT III: PRACTICAL WORK**

- 3.1 Visit to important wildlife habitats of J & K to study different habitat aspects and to identify the animals in the field
- 3.2 Study of species diversity by various methods
- 3.3 Study of vegetation by quadrat method to determine frequency, density, abundance and distribution pattern

**P. G. Department of Zoology**  
**syllabus**  
**University of Kashmir, Srinagar**  
**3<sup>rd</sup> Semester**

**M.Sc**

- 3.4 Study of pugs and hooves of wild animals in the field
- 3.5 Operation of GPS, field binoculars and digital camera

**SUGGESTED BOOKS/READING MATERIAL**

1. *Fundamentals of wildlife Management* -2<sup>nd</sup> edition) **Rajesh Gopal** (2012) Natraj Publishers, Dehradun India
2. *Wilderness Wildlife* **G. A. Bhat** (2008) Book Vision Hazratbal Srinagar
3. *The Book of Indian Reptiles*, **Daniel J.C.** (1983) Bombay Natural History Society, Bombay
4. *Reptiles and Amphibians*, **Richard Oulahan** 1977 Time-Life Films, Inc.USA
5. *The Life of Vertebrates*, **Young J. Z.** (1962) Oxford University Press London
6. *Biology and Comparative Physiology of Birds* **A. J. Marshall** (1961) Academic Press, New York

**ZOO-310-OE: FISH FEED, MANAGEMENT AND CULTURE**

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 FEED AND MANAGEMENT**

- 1.1 Artificial food and feeding
- 1.2 Fish feed formulation
- 1.3 Rational fishery
- 1.4 Methods of fish transport and management

**UNIT II: FISH CULTURE**

- 2.1 Trout culture
- 2.2 Carp & Cat fish culture
- 2.3 Composite fish farming/polyculture
- 2.4 Integrated fish farming

**SUGGESTED BOOKS/READING MATERIAL**

1. A Text Book of Fish Biology & Fisheries by **S S Khanna** and **H R Singh** Narendra Publishing House

**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**

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** CRC publication
4. *Fish And Fisheries* by **B.N. Yadav** Daya Publishing House
5. *The Chemical Biology of Fishes* by **R. Malcolm Love** 1970 & 1980 Academic Press Inc.
6. *Industrial Fishery Technology* by **Maurice E. Stansby & John A. Dasso** Reinhold Publishing Corporation  
Chapman & Hall London
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

- 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*

**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
- 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-110-OE: WILDLIFE CONSERVATION AND MANAGEMENT**

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: 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



**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

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*, *Entrobilus* & *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](http://www.springer) & [www.biomed](http://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: MAMMALOGY 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.

**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

- 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

**P. G. Department of Zoology**  
**syllabus**  
**University of Kashmir, Srinagar**  
**3<sup>rd</sup> Semester**

**M.Sc**

- 3.4 Study of pugs and hooves of wild animals in the field
- 3.5 Operation of GPS, field binoculars and digital camera

**SUGGESTED BOOKS/READING MATERIAL**

1. *Fundamentals of wildlife Management* -2<sup>nd</sup> edition) **Rajesh Gopal** (2012) Natraj Publishers, Dehradun India
2. *Wilderness Wildlife* **G. A. Bhat** (2008) Book Vision Hazratbal Srinagar
3. *The Book of Indian Reptiles*, **Daniel J.C.** (1983) Bombay Natural History Society, Bombay
4. *Reptiles and Amphibians*, **Richard Oulahan** 1977 Time-Life Films, Inc.USA
5. *The Life of Vertebrates*, **Young J. Z.** (1962) Oxford University Press London
6. *Biology and Comparative Physiology of Birds* **A. J. Marshall** (1961) Academic Press, New York

**ZOO-310-OE: FISH FEED, MANAGEMENT AND CULTURE**

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 FEED AND MANAGEMENT**

- 1.1 Artificial food and feeding
- 1.2 Fish feed formulation
- 1.3 Rational fishery
- 1.4 Methods of fish transport and management

**UNIT II: FISH CULTURE**

- 2.1 Trout culture
- 2.2 Carp & Cat fish culture
- 2.3 Composite fish farming/polyculture
- 2.4 Integrated fish farming

**SUGGESTED BOOKS/READING MATERIAL**

1. A Text Book of Fish Biology & Fisheries by **S S Khanna** and **H R Singh** Narendra Publishing House

**P. G. Department of Zoology**  
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**University of Kashmir, Srinagar**  
**3<sup>rd</sup> Semester**

**M.Sc**

2. An Introduction to Fishes by H.S. Bhamrah, Kavita Juneja Anmol Publications Pvt Ltd
3. Fish and Fisheries by Yadav, B N Daya Publishing House
4. Fishes: An Introduction to Ichthyology by Peter B. Moyle Joseph J. Cech Jr., Prentice Hall India Learning Private Limited
5. Aquaculture - Principles and Practices by T. V. R. Pillay Wiley-Blackwell; New edition edition
6. Fish and Fisheries of India by V. G. Jhingram Hindustan Publishing Corporation

**ZOO-311-OE: BENEFICIAL AND HARMFUL INSECTS**

Total Credits: 2 (2 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: BENEFICIAL INSECTS**

- 1.1 Insects as human food
- 1.2 Insects as pollinators
- 1.3 Insects in medicine
- 1.4 Role of insects in forensic science

**UNIT II: HARMFUL INSECTS**

- 2.1 Household insects
- 2.2 Occurrence, life cycle and control of some major insect pests on apple in Kashmir
- 2.3 Damage, life cycle and migratory behavior of locusts

**SUGGESTED BOOKS/READING MATERIAL**

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**4<sup>th</sup> Semester**

**M.Sc**

**UNIT III: PRACTICALS**

- 3.1 Morphological adaptations in hill-stream fishes
- 3.2 Determination of temperature, pH and transparency of water bodies
- 3.3 Determination of dissolved oxygen, free carbon dioxide, total alkalinity of water bodies/ water sample
- 3.4 Qualitative and quantitative analysis of zooplankton local water bodies
- 3.5 Permanent slide preparation of planktons from local water bodies

**SUGGESTED BOOKS/READING MATERIAL**

1. *Textbook of Limnology* by **Goldman and Horne** McGraw Hill Higher Education
2. *Limnology: Lake and River Ecosystems* by **Robert G. Wetzel** Academic Press
3. *Fundamentals of Limnology* by **Arvind Kumar** Ashish Publishing House
4. *Advances in Limnology* by **H.R. Singh** Narendra Publishing House
5. *Ecology and Field Biology* Robert by **Leo Smith** Harper & Row, Publisher

**ZOO-410-OE: BASIC PARASITOLOGY AND DEFENCE MECHANISM**

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: BASIC PARASITOLOGY**

- 1.1 Host-Parasite interactions– general account
- 1.2 Parasitic adaptations
- 1.3 Zoonotic diseases
- 1.4 Anthelmintics– elementary idea

**UNIT II: GENERAL DEFENCE MECHANISM**

- 2.1 Introduction to innate immunity

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**4<sup>th</sup> Semester**

**M.Sc**

- 2.2 Elementary idea about adaptive immunity
- 2.3 Immunization: active and passive immunization
- 2.4 Important immune-deficiency diseases

**SUGGESTED BOOKS/READING MATERIAL**

1. *Animal Parasitology* by **J. D. Smyth**
2. *Basic Immunology* by **Sharon, J. William and Wilkins**
3. *Foundations of Parasitology* by **Gerald D. Schmidt and Larry S. Roberts**
4. *Foundations of Parasitology* by **Larry S. Roberts, John Janovy and Steve Nadler**
5. *General Parasitology* by **Thomas C. Cheng**
6. *Helminthes Arthropods and Protozoa of Domesticated Animals* by **EJL Soulsby**
7. *Immunology* by **F. M. Burnet**
8. *Immunology* by **Kuby, J., Goldsby, R., Kindt, T.J. and Osbourne, B.A., W.H. Freeman**
9. *Immunology* by **Roitt, I.M., Brostoff, J. and Male, D. Mosby**
10. *Introduction to Parasitology* by **ASA C. Chandler & Clark P. Read**
11. *Medical Immunology for Students* by **Playfair, J.H.L. and Lydyard, P.M. Churchill**
12. *Monning's Veterinary Helminthology and Entomology* by **Geoffreng Lapage**
13. *Parasitology (Protozoology & Helminthology)* by **K. D. Chatterjee**

**ZOO-411-OE: BIODIVERSITY, WILDLIFE BIOLOGY AND TECHNIQUES**

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: BIODIVERSITY: CONCEPT AND STATUS**

- 1.1 Biodiversity: concept and levels, reasons for extinction of biodiversity
- 1.2 Biogeographical zones of India with special reference to distribution of wild fauna
- 1.3 Biodiversity hotspots, national & international conservation organizations (BNHS, WWF, IUCN)

- 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*

**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
- 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-110-OE: WILDLIFE CONSERVATION AND MANAGEMENT**

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: 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 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**

- 1. *Fundamentals of wildlife Management* -2<sup>nd</sup> edition) **Rajesh Gopal** (2012) Natraj Publishers, Dehradun India
- 2. **Wilderness Wildlife** **G. A. Bhat** (2008) Book Vision Hazratbal Srinagar
- 3. *Wildlife in India*, **V. B. saharia** (1982) Natraj Publishers Dehradun
- 4. [www.jkwildlife.com](http://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

**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

- 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

**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

- 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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**3<sup>rd</sup> Semester**

**M.Sc**

2. An Introduction to Fishes by H.S. Bhamrah, Kavita Juneja Anmol Publications Pvt Ltd
3. Fish and Fisheries by Yadav, B N Daya Publishing House
4. Fishes: An Introduction to Ichthyology by Peter B. Moyle Joseph J. Cech Jr., Prentice Hall India Learning Private Limited
5. Aquaculture - Principles and Practices by T. V. R. Pillay Wiley-Blackwell; New edition edition
6. Fish and Fisheries of India by V. G. Jhingram Hindustan Publishing Corporation

**ZOO-311-OE: BENEFICIAL AND HARMFUL INSECTS**

Total Credits: 2 (2 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: BENEFICIAL INSECTS**

- 1.1 Insects as human food
- 1.2 Insects as pollinators
- 1.3 Insects in medicine
- 1.4 Role of insects in forensic science

**UNIT II: HARMFUL INSECTS**

- 2.1 Household insects
- 2.2 Occurrence, life cycle and control of some major insect pests on apple in Kashmir
- 2.3 Damage, life cycle and migratory behavior of locusts

**SUGGESTED BOOKS/READING MATERIAL**

**P. G. Department of Zoology**  
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**University of Kashmir, Srinagar**  
**3<sup>rd</sup> Semester**

**M.Sc**

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

**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**

- 1. *Fundamentals of wildlife Management* -2<sup>nd</sup> edition) **Rajesh Gopal** (2012) Natraj Publishers, Dehradun India
- 2. **Wilderness Wildlife** **G. A. Bhat** (2008) Book Vision Hazratbal Srinagar
- 3. *Wildlife in India*, **V. B. saharia** (1982) Natraj Publishers Dehradun
- 4. [www.jkwildlife.com](http://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**



**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

- 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

**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

- 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

**P. G. Department of Zoology**  
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**3<sup>rd</sup> Semester**

**M.Sc**

**ZOO-302-CR: CELL AND MOLECULAR 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: CELL BIOLOGY**

- 1.1 Cellular diversity: Structural features of prokaryotic & eukaryotic cells
- 1.2 Membrane structure and function: Structure of model membranes, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport
- 1.3 Cytoskeleton: Microtubules, microtubular organelles and microfilament
- 1.4 Cell division & cell cycle: Mitosis and meiosis, their regulation & control

**UNIT II: CELL SIGNALING AND TRANSDUCTION**

- 2.1 Cell signaling: Signaling molecules and modes of cell-cell signaling
- 2.2 Cell surface receptors: G- protein coupled receptors, receptor protein-tyrosine kinases, cytokine– receptors and non-receptor protein tyrosine kinases
- 2.3 Signal transduction pathways: MAP kinase and JAK/STAT pathways
- 2.4 Cell transduction and cytoskeleton: Integrins and signal transduction, regulation of the actin cytoskeleton

**UNIT III: MOLECULAR BIOLOGY**

- 3.1 Mechanism of DNA biosynthesis in prokaryotes
- 3.2 DNA damage and repair
- 3.3 Structure & types of RNA and mechanism of its synthesis in prokaryotes
- 3.4 Protein synthesis and processing

**UNIT IV: PRACTICAL WORK**

- 4.1 Preparation of temporary stained mount of the onion root for various mitotic stages
- 4.2 Preparation of permanent stained mount of the grasshopper or cockroach testis for the various stages of meiotic division
- 4.3 Isolation and study of giant chromosomes of *Chironomus* larva and *Drosophila* larva
- 4.4 Slide study of various stages of mitotic and meiotic divisions
- 4.5 Preparation of stained slides of squamous epithelial/ neutrophil cells and study of Barr body
- 4.6 Rearing of fruit fly and study of red and white character after crossing

**SUGGESTED BOOKS/READING MATERIAL**

1. *Molecular Biology of the Cell* by **Alberts et al.** Garland Science

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**4<sup>th</sup> Semester**

**M.Sc**

**ZOO-402-CR: BIOLOGICAL TECHNIQUES AND IMMUNOLOGY**

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: BIOLOGICAL TECHNIQUES-1**

- 1.1 Electron Microscopy: SEM & TEM
- 1.2 Histological Techniques
- 1.3 Principles and uses of pH meter and Spectrophotometer
- 1.4 Electrophoresis

**UNIT II: BIOLOGICAL TECHNIQUES-2**

- 2.1 Microtomy and micrometry
- 2.2 Sub-cellular fractionation and centrifugation
- 2.3 PCR, Blotting techniques; cytogenetic techniques: FISH & GISH
- 2.4 Chromatography

**UNIT III: TUMOUR IMMUNOLOGY**

- 3.1 Introduction to tumors and their immune surveillance
- 3.2 Host immune response to tumors
- 3.3 Tumor escape mechanisms
- 3.4 Tumor immune therapy: Non-Specific and antigen Specific treatment

**UNIT IV: PRACTICAL WORK**

- 4.1 Working of different Microscopes
- 4.2 Preparation of Histological sections of vertebrate tissues viz. liver, gut, lungs
- 4.3 Location of nucleic acids and proteins in tissue sections
- 4.4 Separation of mitochondria through centrifugation
- 4.5 Gel Electrophoresis
- 4.6 Thin layer chromatography

**SUGGESTED BOOKS/READING MATERIAL**

- 1. *Biotechniques Theory and Practice* by **S. V. S. Rana** Rastogi publishers
- 2. *Molecular Biology of the Cell* by **Alberts et al.** Garland Science
- 3. *Immunology* by **Kuby, J., Goldsby, R., Kindt, T.J. and Osbourne, B.A., W.H. Freeman**
- 4. *Medical Immunology for Students* by **Playfair, J.H.L. and Lydyard, P.M. Churchill**

**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**

1. *Principles of Systematic Zoology* by **Ernst Mayr** Tata Mc Graw Hill Publishing Company
2. *Principles of Systematic Zoology* by **Peter D. Ashlock and Ernst Mayr** Tata Mc Graw 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. *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

**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

**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**

**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

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**



**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

**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

**P. G. Department of Zoology**  
**Syllabus CBCS 2015**  
**University of Kashmir, Srinagar**  
**2<sup>nd</sup> Semester**

**M. Sc**

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](http://www.springer) & [www.biomed](http://www.biomed) for latest advances