

Choice Based Credit System (CBCS) Scheme for 3rdSemester

Course Code	Course Title	Course Type	Hours / Week			Credits	Examinations / Marks		
			L	T	P		Continuous Assessment I	Continuous Assessment II	Term End Examination
ZO17301CR	Molecular Biology&Genetics	Core	4	0	0	4	25 marks	25 marks	50 marks
ZO17302CR	Biostatistics &Biotechniques	Core	4	0	0	4	25 marks	25 marks	50 marks
ZO17303CR	Lab course	Core	0	2	6	4	25 marks	-	75 marks
ZO17304DCE	Wildlife Biology, Conservation and Techniques	Discipline Centric	3	0	0	3	25 marks	-	50 marks
ZO17305DCE	Biogeography, Wildlife Ecology and Natural Resource Management	Discipline Centric	3	0	0	3	25 marks	-	50 marks
ZO17306DCE	Techniques and Methods of Wildlife Study	Discipline Centric	0	0	4	2	-	-	50 marks
ZO17005GE	General Parasitology& Protozoology	Generic Elective	2	0	0	2	-	-	50 marks
ZO17006GE	Aquaculture and Fish Nutrition	Generic Elective	2	0	0	2	-	-	50 marks
ZO17003OE	Beneficial and Harmful Insects	Open Elective	2	0	0	2	-	-	50 marks

GENERAL INSTRUCTIONS

1. A candidate has to obtain 24 credits per semester *i.e.*, 96 credits in two year programme (4 semesters).
2. Out of 24 credits in a semester, a candidate has to compulsorily obtain 12 credits from “**Core Courses**” (CR) while the remaining 12 credits can be obtained from the “**Electives**” in the following manner:
 - ▶ A candidate has to obtain 8 credits from his/her own Department as **Discipline Centric Electives (DCE)**.
 - ▶ 4 credits shall be obtained by a candidate from the **Electives** offered by the Departments other than his/her own. A candidate shall be free to obtain these 4 credits from the **Generic** or **Open Electives** or a combination of both; however, all 4 credits can be obtained from Generic Electives, but a maximum of 2 credits can be obtained from Open Electives.
3. Maximum Marks per Credit = 25 (One unit is equivalent to one credit).
4. One Credit in Theory is 16 hours direct teaching learning; where as in Practicals and Tutorials it is 32 hours.

Course No.: ZO17301CR

Course Title: **Molecular Biology & Genetics**

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

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

Unit I: Cell Regulation

- 1.1 Cell signaling: Signaling molecules and modes of cell-cell signaling; Cell surface receptors
- 1.2 Signal transduction pathways: MAP kinase and JAK/STAT pathways
- 1.3 Apoptosis and Cell renewal
- 1.4 Cancer Biology

Unit II: Molecular Biology

- 2.1 DNA structure and replication in prokaryotes
- 2.2 DNA damage and repair
- 2.3 Structure & types of RNA;transcription in prokaryotes
- 2.4 Protein synthesis and processing

Unit III: Genetics

- 3.1 Mendelian and Non-Mendelian inheritance, non-allelic gene interaction
- 3.2 Mechanisms of sex determination, Sex linked inheritance and dosage compensation
- 3.3 Molecular mechanism of crossing over; transposable genetic elements and their evolutionary significance
- 3.4 Regulation of Gene expression in Prokaryotes and Eukaryotes

Unit IV: Genomics and Mapping

- 4.1 Concept of Genomics and Human Genome Project.
- 4.2 Gene Mapping: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids
- 4.3 Human genetics: Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders
- 4.4 Gene manipulation: Recombinant DNA technology– basics and applications, transgenic animals

Suggested Books / Reading Material

1. *Molecular Biology of the Cell* by **Alberts et al.** Garland Science
2. *Molecular Cell Biology* by **Lodish et al.**
3. *Biochemistry* by **Voet & Voet**
4. *Principles of Biochemistry* by **Lehninger**
5. *Science of genetics* by **Atherlay**
6. *The Cell : A Molecular Approach* by G. M. Cooper and R. E. Hausman, Sunderland publishers, USA
7. *Principles of Genetics* by **Gardner et al** John Wiley
8. *Genomes* by **Brown, T. A** Garland Science Publishing, London, UK
9. *Genes IX* by **Benjamin Lewin** Jones and Bartlett Publishers
10. *Molecular Biology of Gene* by **Watson et al** Pearson Education, Delhi, India
11. *Principle of Genome Analysis and Genomics* by Primrose, S. B. and Twyman R. M. Blackwell Publishing

Course No.: ZO17302CR

Course Title: **Biostatistics & Biotechniques**

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

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

Unit I: Biostatistics

- 1.1 Methods of sampling; diagrammatic and graphic representation of data
- 1.2 Measures of central tendency: mean, median and mode; measures of dispersion: standard deviation and standard error
- 1.3 Probability and probability distribution: binomial distribution, poisson distribution and normal distribution
- 1.4 Tests of significance: Chi square test, students T test and ANOVA (one way analysis)

Unit II: Microscopy & Analytical Techniques

- 2.1 Microscopy
- 2.2 Electron Microscopy: SEM & TEM
- 2.3 Techniques for the preparation of Fixatives and Preservatives
- 2.4 Analytical techniques in bio-chemistry for small-molecular quantification

Unit III: Molecular Techniques

- 3.1 Centrifugation and its applications
- 3.2 Electrophoresis and its applications
- 3.3 Blotting techniques
- 3.4 PCR variants and its applications; Cytogenetic techniques: FISH & GISH

Unit IV: Chromatography, Immunoassay and Radiography

- 4.1 Chromatography
- 4.2 Immunoassays
- 4.3 Radioisotope techniques
- 4.4 X-ray diffraction

Suggested Books / Reading Material

1. Fundamentals of Biostatistics by Khan and Khanum, Ukaaz Publications
2. Biotechniques Theory and Practice by S. V. S. Rana Rastogi publishers
3. Principles and techniques of Biochemistry and Molecular Biology by Wilson and Walker

Course Code: ZO17303CR

Course Title: Practicals based on 301CR &302CR

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

Maximum Marks: 100 (25 + 75)

1. Preparation of temporary stained mount of the onion root for various mitotic stages
2. Preparation of temporary stained mount of the grasshopper testis for various meiotic stages
3. Slide study of various stages of mitotic and meiotic divisions
4. Study of Barr body through stained slides of squamous epithelial / neutrophil cells
5. Rearing of fruit fly and study of red and white character after crossing
6. Structure and Working of different Microscopes
7. Preparation of Histological sections of vertebrate tissues viz., liver, gut, lungs
8. Location of nucleic acids in tissue sections
9. Location of proteins in tissue sections
10. Separation of mitochondria through centrifugation
11. Gel Electrophoresis
12. Thin layer chromatography
13. Representation of collected/hypothetical data through:
 - a. Histogram
 - b. bar chart
 - c. pie charts
14. Statistical analysis on hypothetical data:
 - a. chi square analysis
 - b. students t test
 - c. ANOVA

Course Code: ZO17304DCE

Course Title: **Wildlife Biology, Conservation and Techniques**

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

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

Unit I: Wildlife Biology

- 1.1. Mammalogy: Introduction, Adaptation (aquatic and terrestrial), Thermoregulation
- 1.2. Ornithology: Introduction, Migration in birds, Important bird areas (IBAs) of J&K
- 1.3. Reptiles: Biology of Crocodiles and Lizards, Adaptations in Reptiles
- 1.4. Amphibia: General account, Parental care

Unit II: Conservation Biology

- 2.1. *In situ* and *Ex situ* conservation
- 2.2. Keystone species: concept and its relevance for conservation
- 2.3. Wildlife conventions: Ramsar, Bonn, CITES
- 2.4. Conservation Projects: Tiger, Hangul and crocodile

Unit III: Wildlife Techniques

- 3.1 Remote sensing and GIS: concept and applications in wildlife
- 3.2 Methods of studying wildlife census, use of radio transmitters in wildlife study
- 3.3 Capture of wildlife: live trapping, mist netting, Chemical capture (equipments & drugs)
- 3.4 Bird ringing and banding

Suggested Books / Reading Material

1. Wildlife Biology by Raymond F. Dasmann
2. Mammalogy by Nicholas J. Czaplewski, James M. Ryan, Terry A. Vaughan
3. Handbook of Bird Biology by Irby J. Lovette and John W. Fitzpatrick
4. Important Bird Areas of Jammu and Kashmir by A. R. Rahmani, Khurshid A., I. Suhail, P. Chandan and Ashfaq A. Zarri
5. Conservation Biology. Richard B. Primack (2017). Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, U.S.A
6. Managing our Wildlife Resources by S. A. Anderson
7. Remote Sensing and Image Interpretations, Lillesand, T. M.; Kiefer, R. W.; Chipman, J. W. (2004) John Wiley and Sons, Inc
8. Manual of Wildlife Techniques of India, Sale and Berkmuller. Wildlife Institute of India, Dehradun.

Course Code: **ZO17305DCE** Course Title: **Biogeography, Wildlife Ecology and Natural Resource Management**

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

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

Unit I: Biogeography and Wildlife Ecology

- 1.1 Biogeographic realms of the world and their fauna
- 1.2 Insular Biogeography, Biological dispersal: mechanisms and barriers
- 1.3 Biogeographical zones of India with special reference to distribution of wild fauna
- 1.4 Predation- concept, problems and principles

Unit II: Wildlife Health and Management of Natural Resources

- 2.1 Major diseases of wild fauna (Viral and Bacterial)
- 2.2 National and international wildlife organizations (BNHS, WWF-I & World & IUCN)
- 2.3 Wildlife Protection Act (1972); J & K Wildlife protection act (1978)
- 2.4 Management of Wildlife resources

Unit III: Food and Cover

- 3.1 Components of Wildlife habitat
- 3.2 Food components selection and management implications
- 3.3 Wildlife habitat types and their significance
- 3.4 Prey base of carnivores in wild habitat

Suggested Books / Reading Material

1. Biogeography, Fourth Edition by Mark V. Lomolino, Brett R. Riddle, Robert J. Whittaker, James H. Brown (2010) Sinauer Associates, Inc.; Fourth edition
2. Zoogeography: The Geographic Distribution of Animals, Philip J. Darlington (1957)
3. Basics of Wildlife Health Care and Management, Rajesh Jani (2012) Narendra Publishing House Delhi
4. An Introduction to Applied Biogeography Ian F. Spellerberg, John W. D. Sawyer (1999) Cambridge University Press
5. Wildlife Ecology and Management by Bolen and Robinson Printice Hall International (UK)
6. Animal Ecology and Distribution of Animals by Rastogi and Jayaraj
7. Managing our Wildlife Resources by S. A. Anderson
8. Fundamentals of Wildlife Management by Rajesh Gopal Natraj Publishers, Dehradun India

Course Code: **ZO17306DCE**
Total Credits: **2** (0 L + 0 T+ 2 P)

Course Title: **Techniques and Methods of Wildlife study**
Maximum Marks: **50**

Unit I: Field Methods

- 1.1 Methods for studying behaviour of wild animals in the field
- 1.2 Monitoring of wild animals and demonstration of Census methods in the field
- 1.3 Visit to important wildlife habitats of J & K to study different habitat aspects and to identify the animals in the field
- 1.4 Operation of GPS, range finder, field binoculars and digital camera
- 1.5 Mapping distribution of primates, carnivores and ungulates
- 1.6 Study and preparation of pugs and hooves of wild animals in the field
- 1.7 Study of vegetation by quadrat method to determine frequency, density, abundance and distribution pattern

Unit II: Lab Methods

- 2.1 Reference slide preparation of hair samples of different wild and domestic mammals
- 2.2 Diet analysis of wild carnivores through scat analysis
- 2.3 Examination of faecal matter of wild animals for helminth infection
- 2.4 Ecological Distribution and Comparative study of structural adaptations of some mammals, birds, reptiles and amphibians available in the museum
- 2.5 Comparative studies of dentition and skull of different mammals
- 2.6 Identification of poisonous and non-poisonous snakes
- 2.7 Examination and drawing of museum materials: beaks, claws, feathers and nests of characteristic species

Course Code: ZO17005GE

Course Title: General Parasitology and Protozoology

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

Maximum Marks: 50

Unit I: Introduction to Parasitology

- 1.1 Introduction to Animal Associations. Concepts and definitions in Parasitology
- 1.2 Origin, evolution and distribution of parasites in animal kingdom
- 1.3 Parasitic adaptations (Morphological & Physiological) & Zoonosis
- 1.4 Host parasite relationships- general account

Unit II: Protozoology

- 2.1 Introduction to Protista and protistan parasites of Man (Luminal & Blood)
- 2.2 Life cycle, pathogenicity and control of *Entamoeba* & *Leishmania*
- 2.3 Pathogenicity & control of malaria with special emphasis on immune-prophylaxis
- 2.4 Opportunistic protozoan parasites of man: *Toxoplasma gondii* & *Cryptosporidium parvum*

Suggested Books / Reading Material

1. *Parasitology* by Elmer R. Nobel and Glenn A. Noble
2. *Animal Parasitology* by J. D. Smyth
3. *Parasitology (Protozoology & Helminthology)* by K. D. Chatterjee
4. *Foundations of Parasitology* by Gerald D. Schmidt and Larry S. Roberts
5. *General parasitology* by Thomas C. Cheng
6. *Foundations of Parasitology* by Larry S. Roberts, John Janovy and Steve Nadler
7. Besides, the students are advised to visit www.springer & www.biomed for latest advances

Course Code: **ZO17006GE**

Course Title: **Aquaculture and Fish Nutrition**

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

Maximum Marks: **50**

Unit I: Aquaculture

- 1.1. Aquaculture criteria and practices
- 1.2. Site selection, construction and management of fish pond
- 1.3. Induced breeding and its significance in aquaculture
- 1.4. Procurement of stocking material for aquaculture

Unit II: Fish Nutrition

- 2.1. Food and feeding habits of fish
- 2.2. Types of fish feed Classification of fish feed ingredients and Fish feed formulation
- 2.3. Protein and carbohydrate requirement in fishes
- 2.4. vitamin and mineral requirement in fishes

Suggested Books / Reading Material

1. Aquaculture: Principles and Practices by **TVR Pillay**, Blackwell publications
2. Textbook of Fish Culture- Breeding and Cultivation of Fish Huet, M. Fishing News (Books) Ltd.
3. Fresh Water Fish Pond and Culture and Management by **Chakroff M.** Scientific Publishers,

Course Code: **ZO17003OE**

Course Title: **Beneficial and Harmful Insects**

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

Maximum Marks: **50**

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 Insect of medical importance-general account
- 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

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**