

**Akkamahadevi Women's University, Vijayapur**  
**M.Sc. Zoology Choice Based Credit System (CBCS) Syllabus**  
**CORE SUBJECT: ZOOLOGY – [Post Graduate]**  
**Scheme of M.Sc Zoology Programme**

[illegible]

Semester III														
HCT-3.1	Animal Physiology	04		04	15		15		70		100			
HCT-3.2	Reproductive Biology and Endocrinology	04		04	15		15		70		100			
SCT-3.3	a. Animal behavior (optional) b. Microbiology (optional) c. Toxicology (optional)	04		04	15		15		70		100			
HCP-3.4	Animal Physiology practical based on HCT-3.1		02	02		07		07		36	50			
HCP-3.5	Reproductive Biology and Endocrinology practical based on HCT-3.2		02	02		07		07		36	50			
HCP-3.6	Report submission on filed visit and slide preparation		02	02		07		07		36	50			
HCP-3.7	Based on SCT-3.4 a/b/c		02	02							50			
OE-3.8	Parasitology	04		04	15		15		70		100			
	<b>Total</b>	<b>16</b>	<b>06</b>	<b>24</b>	<b>75</b>	<b>21</b>	<b>75</b>	<b>21</b>	<b>350</b>	<b>108</b>	<b>600</b>			
Semester IV														
HCT-4.1	Environmental Biology	04		04	15		15		70		100			
HCP-4.2	Project work and submission of Dissertation		06	06		25		25	100		150			
SCT-4.3	a. Evolutionary Biology (optional) b. Bioinformatics and Biostatistics (optional) c. Animal Biotechnology (optional)	04		04	15		15		70		100			
HCP-4.4	Environmental Biology practical based on HCT-4.2		02	02		7		7		36	50			
O.E-4.5	Applied Zoology	04		04	15		15		70		100			
	<b>Total</b>	<b>12</b>	<b>08</b>	<b>20</b>	<b>45</b>	<b>32</b>	<b>45</b>	<b>32</b>	<b>310</b>	<b>36</b>	<b>500</b>			
	<b>Programme total</b>										<b>2500</b>			

L-  
Lecture,

T- Tutorial, P- Practical.

HCT- Hard Core Theory, SCT- Soft Core Theory, OE- Open Elective, HCP- Hard Core Practical, SCP- Soft Core Practical.

HCPW- Hard Core Project Work/Dissertation.

\*The project evaluation marks 150 are a total of 70 marks for dissertation, 30 marks for presentation and viva voce and 50 marks for internal assessment.

## **Scheme of Teaching, Examination and Credit points of M.Sc. Zoology** **Programme w.e.f. 2018-19**

Semester	Paper No. and Title	Teaching Hrs/week	Internal Assessment	Exam Hrs	Exam Marks	Credits
<b>I</b>	HCT-1.1: Animal systematics	04	30	03	70	04
	HCT-1.2: Biology of Non-chordates	04	30	03	70	04
	HCT-1.3: Cell and Molecular Biology	04	30	03	70	04
	SCT-1.4: a. Basic and Applied Entomology	04	30	03	70	04
	SCT-1.4: b. Biodiversity					
	SCT-1.4: c. Vectors and Communicable Diseases					
	HCP-1.5: Animal systematics practical based on HCT -1.1	04	14	04	36	02
	HCP-1.6: Biology of Non-chordates practical based on HCT-1.2	04	14	04	36	02
	HCP-1.7: Cell and Molecular Biology practical based on HCT-1.3	04	14	04	36	02
	SCP-1.8: Based on SCT-1.4 a/b/c	04	14	04	36	02
	OE-1.9: Offered by Department of Women's Studies	04	30	03	70	04
<b>II</b>	HCT-2.1: Biology of Chordates	04	30	03	70	04
	HCT-2.2: Molecular Genetics	04	30	03	70	04
	HCT-2.3: Developmental Biology	04	30	03	70	04
	SCT-2.4: a. Economic Zoology	04	30	03	70	04
	SCT-2.4: b. Wildlife and Conservation					
	SCT-2.4: c. Ornithology					
	HCP-2.5: Biology of Chordates practical based on HCT -2.1	04	14	04	36	02
	HCP-2.6: Molecular Genetics practical based on HCT-2.2	04	14	04	36	02
	HCP-2.7: Developmental Biology practical based on HCT-2.3	04	14	04	36	02
	SCT-2.8: Based on SCT-2.4 a/b/c	04	14	04	36	02
	OET-2.9: Offered by the Department of Women's Studies	04	30	03	70	04
<b>III</b>	HCT-3.1: Animal Physiology	04	30	03	70	04
	HCT-3.2: Reproductive Biology and Endocrinology	04	30	03	70	04
	SCT-3.3: a. Animal behavior	04	30	03	70	04
	SCT-3.3: b. Microbiology					
	SCT-3.3: c. Toxicology					
	HCP-3.4: Animal Physiology practical based on HCT -3.1	04	14	04	36	02
	HCP-3.5: Reproductive Biology and Endocrinology practical based on HCT-3.2	04	14	04	36	02
	HCP-3.6: Report submission on field visit and slide preparation	04	14	---	36	02
	SCP-3.7: Based on SCT-3.4 a/b/c	04	14	04	36	02
	OET-3.8: Parasitology	04	30	03	70	04
<b>IV</b>	HCT-4.1: Environmental Biology	04	30	03	70	04
	HCPW-4.2: Project work and submission of Dissertation	06	50	--	70	06
	SCT-4.4: a. Parasitology	04	30	03	70	04
	SCT-4.4: b. Bioinformatics and Biostatistics					
	SCT-4.4: c. Animal Biotechnology					
	HCP-4.5: Environmental Biology practical based on HCT-4.1	04	14	04	36	02
	HCP-4.6: Applied Zoology	04	14	04	36	02
<b>Total Marks (I to IV Semester) = 2100 + 400 (OET)</b>						

**HCT: Hard Core Theory; SCT: Soft Core Theory; HCP: Hard Core Practical**  
**HCPW: Project Work and Dissertation, OET: Open Elective Theory**

**Akkamahadevi Women's University, Vijayapur**  
**M. Sc. Zoology, Choice Based Credit System (CBCS) Syllabus,**  
**CORE SUBJECT: ZOOLOGY – [Post Graduate]**

<b>Semester-I</b>	<b>Hrs/Week</b>	<b>Credits</b>
HCT-1.1. Animal systematics	04	04
HCT-1.2. Biology of Non-chordates	04	04
HCT-1.3. Cell and Molecular Biology	04	04
SCT-1.4. a. Basic and Applied Entomology		
SCT-1.4. b. Biodiversity		
SCT-1.4. c. Vectors and Communicable diseases	04	04
HCP-1.5. Animal Systematics based on HCT-1.1	04	02
HCP-1.6. Biology of Non-chordates practical based on HCT-1.2	04	02
HCP-1.7. Cell and Molecular Biology practical based on HCT-1.3	04	02
SCP-1.8. Based on the soft core SCT-1.4 a/b/c		02
O.E -1.9 Offered by Dept. of Women's Studies	04	04

Sub. Total: 28

<b>Semester-II</b>		
HCT-2.1. Biology of Chordates	04	04
HCT-2.2. Molecular Genetics	04	04
HCT-2.3. Developmental Biology	04	04
SCT- 2.4. a. Economic Zoology		
SCT- 2.4. b. Wildlife and Conservation		
SCT-2.4. c. Ornithology	04	04
HCP-2.5. Biology of Chordates practical based on HCT-2.1	04	02
HCP-2.6. Molecular Genetics practical based on HCT-2.2	04	02
HCP-2.7. Developmental Biology practical based on HCT-2.3	04	02
SCT-2.8. Based on SCT-2.4 a/b/c	04	02
OET-2.9. Offered by Dept. of women's Studies	04	04

Sub. Total: 28

<b>Semester-III</b>		
HCT-3.1. Animal Physiology	04	04
HCT-3.2. Reproductive Biology and Endocrinology	04	04
SCT- 3.3.a. Animal behavior	04	04
SCT- 3.3.b. Microbiology	04	
SCT-3.3.c. Toxicology	04	
HCP-3.4. Animal Physiology practical based on HCT-3.1	04	02
HCP-3.5. Reproductive Biology and Endocrinology practical based on HCT-3.2	04	02
HCP-3.6 Report submission on filed visit and slide preparation		02
SCP-3.7. Based on SCT-3.4 a/b/c	04	02
OET-3.8. Parasitology	04	04

Sub. Total: 24

<b>Semester-IV</b>		
HCT-4.1 Environmental Biology	04	04
HCPW-4.2. Project work and submission of Dissertation	04	06
SCT-4.3. a. Evolutionary Biology	04	04
SCT-4.3. b. Bioinformatics and Biostatistics		
SCT-4.3.c. Animal Biotechnology		
HCP-4.4.Environmental Biology practical based on HCT-4.2	04	02
O.E-4.6. Applied Zoology	04	04

Sub. Total: 20

Total Credits: 64+06 (Theory + Project) +30 (Practical + Field study or Study tour) = 100 credits

Note:

1. There shall be 30 marks as internal assessment (IA) for each theory paper and 14 marks as IA for each practical paper
2. There shall be 70 marks for each theory paper and 36 marks for each practical final examination at the end of each semester.
3. The project work carries 150 marks (IA- 50 marks; Dissertation-75 and viva voce and presentation 25).

**Open Elective Papers for other Department students:**

<b>Semester- I and II</b>	<b>Hrs/Week</b>	<b>Credits</b>
OET 1.9 and 2.9 – Offered by the Department of Women’s Studies	04	04
<b>Semester-III</b>		
OET-3.8- Parasitology	04	04
<b>Semester-IV</b>		
OET-4.6- Applied Zoology	04	04

**OET Total Credits: 16**

Note:

1. There shall be 30 marks as internal assessment (IA) for each theory paper
2. There shall be 70 marks for each theory paper

# DEPARTMENT OF ZOOLOGY

**Akkamahadevi Women's University, Vijayapur**



**Syllabus**

**For**

**P.G. Studies in**

***ZOOLOGY***

***Choice Based Credit System***

**2018-19 onwards**



**AKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA**  
(Formerly: KARNATAKA STATE WOMEN'S UNIVERSITY)

**Proceedings of the B.O.S Meeting held on 26<sup>th</sup> May 2018 at Dept. of Zoology,  
AWU, Vijaypur.**

**Agenda**

1. Revising the Syllabus of all the theory papers of I to IV semesters
2. Preparation of panel of examiners.
3. Preparation of question paper pattern for theory and practical examination.

**Resolution**

1. The BOS chairman formally invited all the members. The members read the syllabus and incorporated few corrections in papers. The syllabus was amended as per other program in science faculty to have uniformity in terms of credits and marks.
2. Prepared Panel of Examiners and approved for the year 2018-19.
3. Prepared the question paper pattern for theory and practical examination and approved.

**Member Present:**

Prof.B.B.Hosetti

Chairman/Dean

Dr.S.Basavarajappa

After reading the entire syllabus pattern designed to M.Sc. Zoology programme the committee opined the following.

1. The present curriculum is heavy load for both teachers and learners
2. There is need to shorten the same by offering only two open elective theory (OET) at II and III semesters. There is no need of OET at I and IV semester levels.
3. There is need to assign minimum Rs.-50,000/- for study tour/field visits in III semester for Zoology program.

**Members absent**

1. Prof. P Mahaboob Basha

2. Dr. J.L. Rathod

# **Akkamahadevi Women's University, Vijayapur**

## **DEPARTMENT OF ZOOLOGY**

### **M.Sc. Zoology Programme under Choice Based Credit System (CBCS) w.e.f. 2018-19**

**1.1. Duration:** Two years with four semesters, each of 16 weeks duration.

**1.2. Eligibility for admission:** B.Sc. graduates of AWU, Vijayapur or any other recognized university with Zoology as one of the main subject are eligible for admission to M.Sc. Zoology course. Relaxation is for SC/ST/Cat-I students as per university norms.

**1.3. Intake:** 20 students for the first semester that excludes seats under enhanced fee. other rules for admission for intake of students may change from time to time as per university notification.

**2. Attendance:** Every student must have at least 75% attendance in each semester for eligibility to appear for semester end examination.

**3. Medium of Instruction:** The medium of instruction shall be English.

#### **4. Course structure:**

The student desirous for a degree M.Sc. in Zoology shall complete 78 credits in Zoology. Department also offers 8 credits each for elective papers in I, II, III and IV semester for students from other science subjects. Given below are the details about credits for each theory paper/practical/project work/Study tour and number of teaching hours for the four semesters along with marks allocation for students offering M. Sc. Zoology or elective paper in Zoology.



## HCT-1.1: ANIMAL SYSTEMATICS

48 hrs

### Unit 1:

04

**Introduction:** Science of taxonomy, History and stages of taxonomy, Importance of taxonomy, Problems of taxonomists, Aim and tasks of taxonomists, Taxonomy as profession.

### Unit 2:

04

**New trends and approaches in taxonomy:** Morphological, Embryological, Ecological, Behavioral, Cytogenetic, Molecular, Biochemical and Numerical Approaches

### Unit 3:

05

**Zoological classification:** Kinds of classification, Phylogenetic lineages, Components of classification, Linnaean hierarchy, Methods of phylogenetic analysis (phenetic and cladistic methods)

### Unit 4:

05

**Species Concepts:** Historical perspectives of species concepts (Typological, Nominalistic, Evolutionary, Biological, Phylogenetic); other kinds of species; Subspecies; Intraspecific groups (Deme, Form/Morphotype, cline, Variety); Models and mechanism of speciation.

### Unit 5:

08

**a. Taxonomic collection:** Collection of animals, preservation, curating, storage, cataloguing of specimens, Taxidermi, Deterioration of museum specimens, Taxonomic publications,  
**b. Zoological Nomenclature:** Origin of Code, Bicode, Phylacode, ICZN, Rules of Nomenclature

### Unit 6:

10

General outline of animal classification-tree of life, Characters and Classification of Invertebrate Phyla (Protozoa to Echinodermata)

### Unit 7:

08

General characters and Classification of Protochordates; General characters and Classification of Chordates

### Unit 8:

04

Phylogenetic interrelationship between major Invertebrate Phyla; Phylogenetic interrelationship between Protochordates and Chordates

### References:

1. Ernest Mayr. *Principles of Systematic Zoology*, Tata-McGraw-Hill, New Delhi, 1997.
2. Simpson, G.G. *Principles of Animal taxonomy*. Columbia University Press, New York, 1961.
3. Barnes, R.D. *Invertebrates Zoology*. IInd Saunders, Philadelphia, 1968.
4. Kapoor, V.C. *Theory of Animal Taxonomy*, Oxford IBH Co. Pvt. Ltd., New Delhi, 1998.
5. Barrington, E.J.W. *Invertebrates structure and Function*, Nelson, London, 1967.
6. Hawksworth, D.L. (Ed). *Biodiversity: Measurement and Estimation*, Chapman and Hall, 1961.
7. Khan, T.I and Y.S. Shishodia. *Biodiversity Conservation and Sustainable Development*. Pointer Publications, Jaipur, 1998.

## HCT-1.2: BIOLOGY OF NON-CHORDATES

48 hrs

### Unit 1

05

**Introduction:** Functional Morphology of Non-chordates. Organisation of Coelom: Acoelomates, Pseudocoelomates and Coelomates. Protostomia and Deuterostomia.

### Unit 2

06

**Locomotion:** Amoeboid, Flagellar, Ciliary movements in Protozoa. Hydrostatic movement in Cnidaria, Annelida and Echinodermata.

### Unit 3

05

**Nutrition:** Nutrition in Protozoa and in lower Metazoans. Filter feeding in Polychaetes, Molluscs and Echinoderms, Feeding patterns in Insects.

### Unit 4

08

**Respiration:** Organs of Respiration: Gills, Trachea and Lungs in Invertebrates. Respiratory pigments, Mechanism of Respiration.

**Circulation:** Patterns of Circulation and functions of body fluids.

### Unit 5

08

**Excretion:** Excretory Organs, Coelomoducts, Nephridia, Coxal Glands and Malpighian tubules. Mechanism of Excretion in Non-chordates.

### Unit 6

10

**Nervous System:** Primitive Nervous system in Coelenterates and Echinodermata. Advanced Nervous System: Nematoda, Annelida, Arthropoda and Mollusca. Sense organs and their importance.

### Unit 7

06

**Reproduction:** Patterns of Reproduction in Non-chordates. Larval forms and their evolutionary significance.

### References:

1. Barnes, R.D. *Invertebrates Zoology*. Hnd Saunders, Philadelphia, 1968.
2. Barrington, E.J.W. *Invertebrates structure and Function*, Nelson, London, 1967.
3. Hyman, L.H. *The Invertebrates* Vol. I-VI. McGraw-Hill, New York, 1940-67.
4. Russel Hunter, W.D. *Biology of Lower Invertebrates*, Macmillan Company, New York, 1968.
5. Marshall, A.J. and Williams W.D. (Eds). *Text book of Zoology- Invertebrates* VII Ed. Vol. I ALTBS Publications, 1995.

## HCT- 1.3: CELL AND MOLECULAR BIOLOGY

48 hrs

### Unit 1:

04

**Introduction:** History of cell biology; Levels of cell organization (prokaryotes and eukaryotes), Cell as structural and functional unit of organisms, the scope of modern cell biology.

### Unit 2:

06

**Biomembrane:** Molecular organization of Bio-membranes, Transport across cell membrane, Cell to cell communication and recognition, Modifications of membranes: Gap junctions and tight junctions, Membrane receptors, Ion channels, Gated channels.

### Unit 3:

08

**Molecular organization and functions of Cell Organelles:** Endoplasmic reticulum, Golgi complex, Lysosomes, Ribosomes, Peroxisomes, Mitochondria.

**Molecular organization and functions of cytoskeleton structures:** Microfilaments, Microtubules and their role in cell architecture.

### Unit 4:

05

**Nucleus:** Molecular structure of chromosomes, Euchromatin and Heterochromatin, Role of Histone in packing DNA, Non-histone proteins, Organization and functions of Nucleolus.

### Unit 5:

04

**DNA Replication:** Unit of replication, enzymes components involved in replication, replication origin and replication fork, fidelity of replication, Prokaryotic and eukaryotic DNA replication mechanism.

### Unit 6:

04

**DNA Transcription:** Transcription factors and machinery. RNA polymerases. Mechanism of prokaryotic and eukaryotic transcription. Post – transcriptional modifications in RNA: 5'Cap formation, 3'end processing and polyadenylation, Splicing, editing, Nuclear export of mRNA, mRNA stability.

### Unit 7:

06

**Translation:** Genetic code, Ribosome, Enzymes, factors and the process (formation of initiation complex, initiation factors, elongation and elongation factors, termination, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase), translational proof-reading, translational inhibitors. Co-and post – translational modifications of proteins.

### Unit 8:

06

**Cell Cycle:** Molecular events during cell cycle, cyclins and cyclin dependent protein kinases (CDK's). Regulation of CDK cyclin activity.

**Cell Aging:** characteristics and causes of aging; telomeres and aging; **Apoptosis:** Mechanism and significance

### Unit 9:

06

**Cancer Biology:** Characteristics and properties of cancer; Development and causes of cancer, Diagnosis; treatment; Oncogenes, Tumour viruses, Tumor suppressor genes.

### References:

1. Alberts, B., Bray Dennis, Lewis Julian, raff Martin, Roberts K. and Watson J.D. *Molecular biology of Cell*. Garland publishing Inc. New York, 1994.
2. Cellis, J.e. *Cell Biology*. ALaboratory hand book Vol. I and II. Academic Press, 1998.
3. Lodish, H., Berk, A Zipuosky, L.S. Matsudaira, P. Baltimore and Darnell, J. *Molecular Cell Biology* IV Ed. W.H. Freeman and Co., 2001.
4. Malacinski, G.M. and Freifelder D. *Essentials of Molecular Biology* III ed. Jones and Bartlett Publishers, 1998.
5. Molecular Cell Biology. Lodish, Harvey; Berk, Arnold; Zipursky, S.Lawrence;Matsudaira, Paul; Baltimore, David; Darnell, James E. New York: W.H. Freeman& Co. 1999
6. Modern Genetic Analysis. Griffiths, Anthomy J.F. Gelbart, William M, Miller Jeffrey H, Lewontin, Richard C. New York: W.H. Freeman & Co. 1999
7. Molecular Biology of the Cell. Alberts, Bruce; Johnson, Alexander; Lewis, Julian,Raff, Martin; Roberts, Keith; Walter, Peter. New York and London: Garland Science 2002
8. The Cell – A Molecular Approach. Cooper, Geoffrey M.Sunderland (MA): Sinauer Associates, Inc. 2007
9. Introduction to Genetic Analysis. Griffiths, Anthony J.F.; Miller, Jeffrey H.;Suzuki David T.; Lewontin, Richard C, Gelbart, William M. New York: W.H. Freeman & Co. 1999
10. Principles of Genetics. Gardner,E.J., Simmon, S. and Snustad, 8<sup>Th</sup> Edition, John Wiley and sons inc. Publication, New York. 1991

## SCT-1.4a: BASIC AND APPLIED ENTOMOLOGY

48 hrs

### Unit 1:

03

**Insect Taxonomy:** Classification of insects up to orders with suitable examples; Morphology of integument, head, thorax and abdomen and appendages.

### Unit 2:

10

- a. **Structure and function:** Digestive system, respiratory system, excretory system.
- b. **Nervous system:** Sense organs, sound producing organs, photoreceptor and photogenic organs
- c. **Endocrine system:** Hormones and their regulation
- d. **Reproductive system:** Reproductive system, metamorphosis and diapauses in insects

### Unit 3:

10

- Insect pests:** a. Definition, categories, origin of pest, causes for outbreak, economic damage.
- b. **Pest monitoring:** Pest surveillance, forecasting survey and sampling techniques, crop loss estimation.
  - c. **Insect pests of major crops:** Damage, life cycle, seasonal history, status and control of major pests of important crops such as Cereals: Rice, Sorghum, Maize, Wheat; Oil seeds: Sun flower, Saff flower & Groundnut; Vegetable crops: Brinjal, Ladies finger, Cabbage and Beans; Commercial crops: Sugarcane, cotton, Coconut and Coffee.

### Unit 4:

10

**Integrated Pest Management:** History, different phases of pest control, (Quarantine, Physical, Chemical, Biological control and, genetic and biotechnological methods) control. Pheromones- Types, chemical characteristics, biosynthesis and their use in pest management, Pheromone traps.

### Unit 5:

05

#### **Medical Entomology:**

Common insects attacking humans and domestic animals; their life history, mode of attack, type of injury or infection, treatment and control with reference to House fly, Blow flies, Blood sucking insects.

### Unit 6:

10

#### **Culture of commercial Insects:**

- a. Honey bee: Species, role in pollination, bee keeping and management, bee products.
- b. Silk worm: species, silkworm rearing and management, pests of silkworm
- c. Lac Insect: Host plants, Lac cultivation, commercial importance.

#### **References:**

1. Awasti V.B. 2009 Introduction to general entomology 3<sup>rd</sup> Ed. Scientific publication (India), Jodhpur
2. Awasti V.B. 2007, Agricultural Insect Pests and their control. Scientific publishers (India) Jodhpur
3. Trigunayat M.M. 2009, A Manual of practical entomology, scientific publishers, Jodhpur, India.
4. Dhaliwal G.S. Ramsingh and B.S. Chillar 2006, Essentials of Agricultural entomology. Kalyani Publishers, New Delhi.
5. L . K Jha. Applied Agricultural Entomology. New central book agency. Culcutta
6. Rajendra singh. 2007. Elements of Entomology. Published by Rakesh kumar. Rastogi and Rastogi Publications. Gangotri, Shivaji Road. Meerut.

## SCT-1.4 b: BIODIVERSITY

48 hrs

### Unit 1:

03

**Introduction:** Concepts, Definition, Values of diversity, Consumptive use and productive use, Social and Aesthetic values.

### Unit 2:

09

**Genetic diversity:** Genetic diversity, Species diversity, Ecosystem diversity, Biodiversity at global, National and local levels.

**Hot spots of Biodiversity:** Biodiversity hot spots in India, India as a mega diversity country, Endemic species.

### Unit 3:

06

**Concept of biodiversity:** Types of biodiversity and biodiversity profile of India. Ramsar wetlands. General theories of biodiversity: biotic and abiotic theories.

### Unit 4:

12

**a. Threats to Biodiversity:** Deforestation, Habitat destruction, Hunting, and over exploitation, introduction of exotic species, Impact of Pollution on biodiversity.

**b. Wild life status; Endangered, vulnerable, Rare and threatened species**

**c. Conservation of biodiversity:** Objectives, In-situ and Ex-situ conservation, People movement, Role of Educational Institutes and NGO's Biodiversity awareness, programme, Future strategies for biodiversity conservation in India.

### Unit 5:

12

**a. Biodiversity Legislation:** Legal aspects with respect to India, Biodiversity Act, 2002; CBD; CITES, IPR.

**b. Biodiversity and Biotechnology:** Assessment of biodiversity and bioresources, biodiversity conservation, utilization of biodiversity, GMO's and their impact on biodiversity.

### Unit 6:

06

#### **Biodiversity and Management:**

- a.** Organizations associated with biodiversity Management, IUCN, UNEP, UNESCO, WWF, FAD, WCWC, BMC, KBB and BHS; their role and contributions
- b.** Bioprospecting, Biopiracy, Biosafety, Bioremediation.

#### **References:**

1. Dasmann. F Raymond. Wildlife Biology. Wiley Eastern Ltd. India. 1982.
2. Encyclopedia of Nature and Science. Vols 1-18. Bay Books Pvt.Ltd. Sydney, 1974.
3. Burnie. D. (Ed). Animal: the Definitive Visual Guide to the Worlds Wildlife. D.K.Publications, 2001.
4. Singh, M.P. 2009. Biodiversity. APH Publishing Corporation, New Delhi.
5. Saharia, V.B. 1982. Wildlife in India. Natraj Publishers, Dehara Dun.
6. Kotwal, P.C. and Banerjee, S. 2004. Biodiversity Conservation in managed forests and protected areas. Agrobios (India) Publishers, Jodhpur.
7. NBA. 2004. The Biological Diversity Act (2002) and Biological Diversity Rules (2004). NBA, Chennai, India.
8. Kumar, U. and Asija, M. 2005. Biodiversity: Principles and Conservation. 2<sup>nd</sup> Edn. Agrobios (India) Publishers, Jodhpur.
9. B. B. Hosetti 2005. Glimpses of biodiversity, Daya Publishers. Delhi-11
10. B.B.Hosetti and M.Venkateshwarlu 2004. Trends in wildlife biodiversity, conservation and management. Vol. I and II Daya Publishers, Delhi-11.
11. B.B. Hosetti 2008. Concepts in wildlife management, III edition, Daya Publishers, Delhi.

### **SCT-1.4 c: VECTORS AND COMMUNICABLE DISEASES.**

**48 hrs.**

**Unit 1:** Introduction to vector borne diseases and vectors- World scenario; Indian scenario. Historical perspective- Epidemics, discoveries; Scientists and major events involved in the discovery of vectors and pathogens of communicable diseases 08

**Unit 2:** Epidemiology, biology of vectors and pathogens, transmission cycles and symptoms- of malaria, filariasis, yellow fever, leishmaniasis and anthrax. 08

**Unit 3:** Epidemiology, biology of vectors and pathogens, transmission cycles and symptoms- of dengue, chikungunya, Japanese encephalitis, schistosomiasis and plague. 08

**Unit 4:** Distribution, epidemiology and control of Yellow fever, African sleeping sickness, oncocerciasis and chagas disease. 08

**Unit 5:** Mechanical vectors- House flies, cockroaches and bedbugs- Transmission of dysentery, diarrhea, typhoid, cholera, epidemic conjunctivitis and skin infections. 08

**Unit 6:** Control of vector borne diseases; Vector control- Chemical, Biological, Genetic and Environmental. Insecticide resistance in vectors. Drug resistance in pathogens. Importance of education, awareness and Community participation. 08

#### **References:**

1. Clements, A. N., 1992. The biology of Mosquitoes, Vol-I, Chapman and Hall, London.
2. Clements, A. N., 1999. The biology of Mosquitoes, Vol-II, Chapman and Hall, London.
3. Fenemore, P. G. and Alka Prakash., 1992. Applied Entomology, Wiley Eastern Ltd., New Delhi.
4. Gullan, P. J. and Cranston. 1994. The Insects: An outline of Entomology, Chapman and Hall, London.
5. Kenneth, G. V. Smith, 1973. Insects and other arthropods of medical importance. Trustees of British Museum, London.
6. Manson- Bahr, P. E. C. and Bell, D. R., (Ed) 1987. Manson's tropical diseases. English Language Book Society, Barillien Tindall.
7. Metcalf, R. L. and W. B. Flint. 1962. Destructive and useful insects, their habits and control. McGraw Hill Publ. Co., N. Y.
8. Rao, T. R., 1984. The Anophelines of India. Publ. by Malaria Research Centre, Delhi.
9. Service, M. W., 1976. Mosquito ecology. Applied Science Publication Ltd., London.
10. Srivastava, K. P., 1988. A Textbook of Applied Entomology, Publ. Kalyani Publishers, New Delhi.
11. WHO (Geneva), 1989. Geographical distribution of arthropod borne diseases and their principal vectors. WHO. Geneva.

**OET-1.8. Offered by the Department of Women's Studies.**

## HCT-2.1: BIOLOGY OF CHORDATES

48 hrs

### Unit 1: 08

**Introduction:** Origin of Chordates and recent theories, General organization and features of chordates.

Protochordata: Life cycle of Salpa, Doliolum and Amphioxus, Significance of Retrogressive Metamorphosis.

### Unit 2: 06

**Origin and Evolution of** Agnatha, Placoderms and Chondrichthyes, Osteichthyes: Lateral line system, Migration in fishes

### Unit 3: 06

Origin and Evolution of Amphibians, Breeding Behavior and Parental care in living Amphibia, Neoteny and Adaptive radiation Amphibians.

### Unit 4: 06

Origin and Evolution of Reptiles, Adaptive radiation in living Reptiles, Poisonous and Non-poisonous Snakes in India and Extinct Reptiles.

### Unit 5: 06

Origin and evolution of Birds, aerial adaptations and Mechanism of flight, Courtship and Breeding Behaviour and Migration in Birds. Aquatic and Flightless Birds.

### Unit 6: 06

Origin and Evolution of Mammals. Adaptive radiations in Monotremes, Marsupials. Aquatic Mammals. Dentition in Mammals.

### Unit 7: 10

**Comparative anatomy:** Integument and its derivatives, Heart and aortic arches, Brain and Kidney  
**Mammalian endoskeleton:** Axial and Appendicular skeleton

### References:

1. Marshall, A.J. and Williams W.D. (Ed). *Text Book of Zoology: Vertebrates-VII* (Ed.) Vol. II AITBS Publishers and Distributors, 1995.
2. Young, J.Z. *The Life of Vertebrates*. III Ed Clarendon Press, Oxford, 1981.
3. William, N. Mcfarland, F. and Harvey Pough Tom J.C. and Heiser J.B. *Vertebrate Life*. Collier-Macmillan Publihers, London, 1979.
4. Romer, W.B. *The Vertebrates Body*. Saunders, Philadelphia, 1956.

## HCT-2.2: MOLECULAR GENETICS

48 hrs

### Unit 1:

05

**Introduction:** Overview of Mendelian and post Mendelian Genetics; Concept of alleles, complementation test; Cistron, Mutton, Recon, Genome imprinting.

### Unit 2:

10

**DNA structure and functions:** DNA as the hereditary material- Experiments; Watson- Crick model and alternative models; Replication- Enzymology of replication, initiation, elongation and termination; Models of replication; Protein Synthesis; Central dogma of molecular biology, colinearity hypothesis of transcription, translation, post translation modifications; Molecular basis of genetic recombination and repair

### Unit 3:

05

**Genetics of bacterium and bacteriophage:** Transformation, transduction and conjugation in bacteria and life cycle of bacteriophage

### Unit 4:

08

**Gene Regulation:** Operon model- Positive and negative regulation; Transcription factors, Cis & Trans acting elements in eukaryotes; Dosage compensation in Man, *Drosophila* and *Caenorhabditis elegans*

### Unit 5:

06

**Genome Rearrangement:** Cytogenetic implications of duplication, deletion, inversion, translocation; Transposons; Lampbrush and polytene chromosomes

### Unit 6:

06

**Genomics and Proteomics:** Organization of eukaryotic genome; Salient features of yeast, *Drosophila* and human genome, evolutionary genomics; Proteomics

### Unit 7:

08

**Techniques in Molecular genetics:** Electrophoresis and electro focusing; Northern, southern and western blotting techniques; PCR; Gene sequencing, RFLP.

### References:

1. Altherly, A. G., Girtten, J. R. and McDonald, J. F. The Science of Genetics. Saunders College, 1999.
2. Gardner, E. J., Simmons, M. J. and Snustad, D. P. Genetics III Ed. John Willy and Sons, New York, 1990.
3. Stickberger, N. W. Genetics. MacMillan Publishing Co. New York, 1985.
4. Watson, J. D. et al. Recombinant DNA. W. H. Freeman and Co., 1992. Trevor, B. B. and Julian Burke. Gene Structure and Transcription. Oxford University Press. 1998.
5. Benjamin, Lewin. Genes Vol. I-IV. Oxford University Press, 1995.



## HCT- 2.3: DEVELOPMENTAL BIOLOGY

48 hrs

### Unit 1:

03

**Introduction:** Overview of Animal Development, Anatomical and Experimental approach to Developmental Biology, Concepts of totipotency.

### Unit 2:

09

#### **Fertilization and early development:**

Fertilization- Structure of gametes, cellular and biochemical processes during early fertilization, strategies for monospermy and conservation of species, Signal transduction and Egg activation, Prevention of Polyspermy, Nucleo-cytoplasmic interaction during early development in Amoeba, Acetabularia, Frog. Cleavage, Blastula, Gastrulation in Frog and Chick, Fate maps.

### Unit 3:

08

**Early Development in Drosophila:** Development of Larva. Origin of anterior and posterior Polarity, Generation of dorso-ventral polarity. Maternal effects of genes, Segmental genes, Homeotic selector genes.

### Unit 4:

08

**Axis formation of in Amphibians:** Mechanism of progressive determination of Amphibian axis, Primary embryonic induction, Regional specificity of induction, Organizer-functions and diffusible proteins of organizer.

### Unit 5:

10

**Cell differentiation and Organogenesis:** Development of somites and differential cell proliferation in shaping organ primordia, Differentiation of neural tube-anterior posterior axis, Dorso-ventral axis. Differentiation of erythrocytes, Haematopoiesis, Myogenesis- differentiation of bHLH protein, muscle cell fusion; Fate maps.

### Unit 6:

06

**Post-embryonic development and growth:** Regeneration in animals with reference to Hydra, Planaria and Salamander limb. Metamorphosis in Amphibia: Morphological and Biochemical changes and hormonal control of Metamorphosis.

Growth: Concept, isometric and allometric physiological mechanisms.

### Unit 7:

04

**Abnormal development:** Teratology, Causation of abnormal development, Experimental studies and Teratogens.

### References:

1. Gilbert, S.F. *Developmental Biology*. IV Ed. Sinauer Associates Inc. Publishers, Massachusetts, 2000.
2. Kalthoff, K. *Analysis of Biological Development*. McGraw Hill Inc. New York, 1996
3. Rao, K.V. *Developmental Biology: A Modern Synthesis*. Oxford and IBH Publishing Co. Pvt. Ltd., 1993.
4. Subramanian, T. *Developmental Biology*, Narosa Publishing House, 2002.
5. Twyman, R.M. *Instant Notes Developmental Biology*. Bio-scientific Publishers Ltd., 2001.
6. Wolpert, L., Beddington R. Brooks, J. Jessel T. Lawrence P. and Meyerwitz E. *Principles of Development*. Oxford University Press, 1998.
7. The text book of Embryology by Balinsky.

## SCT-2.4a: ECONOMIC ZOOLOGY

48 hrs

### Unit 1:

02

**Introduction:** Overview and scope of Applied Zoology, Economically important animals.

### Unit 2:

08

**Sericulture:** Brief History and Development of Sericulture. Types of Silk Moths, Rearing methods of Silkworms. Grainage activity, Silk production. Silkworm diseases.

### Unit 3:

08

**Apiculture:** Importance, History and Development of Bee keeping. Different species of honey bees and their distribution. Management of beekeeping. Product and byproduct of Apiculture and their uses.

### Unit 4:

08

**Vermiculture:** Importance of Vermiculture. Types of earthworms, Life cycle of earthworm, Use of Earthworms for biodegradation of organic waste materials, Techniques of Vermiculture, Harvesting of Vermicompost and Vermimass, Vermicompost as Soil Conditioner and Earthworms as source of Protein. Vermi-wash.

### Unit 5:

09

**Aquaculture:** Freshwater, brackish water and Marine fish culture in India, Prawn and Pearl culture, Preservation and processing of fish; Fish byproducts.

### Unit 6:

04

**Poultry Science:** Introduction, Breeds of fowls, Poultry rearing (Broiler and layer farming), Nutritive value of egg and meat, Poultry diseases.

### Unit 7:

05

**Dairy Technology:** Introduction, Breeds of cattle, Breeding and Cattle improvement in India. Nutritive value of Milk and Milk by products.

### Unit 8:

04

**Lac culture:** Lac insect, strains of Lac insects, host plants Cultivation, lac culture, composition of Lac, processing of Lac and its uses.

### References:

1. Srivastava, K.P. *Text Book of Applied Entomology*, Vol. I and II Kalyani Publishers, 1996.
2. Mishra, R.C. *Perspectives in Indian Apiculture*. Allied Scientific Publishers, Bikaner, India, 1999.
3. Lee, K.E. *Earthworms: Their Ecology and Relationship with Soils and Land use* Academic Press. London, 1985.
4. Snathanam, R. Sukumaran, N. and Natarajan, P.: *A Manual of Freshwater Aquaculture*, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1990.
5. Bell, F.W. and Canterbury, E.R. *Aquaculture for Developing Countries- A Feasibility Study*. Cambridge: Ballinger Publishing Co. 1976.

## SCT-2.4b: WILDLIFE AND CONSERVATION

48 hrs

### Unit 1:

12

#### **Introduction, History and Scope:**

Importance and values of wildlife. Wildlife categories: Endangered, Threatened, Vulnerable, rare; data Deficient categories, Red Data Book. Causes of wildlife depletion: Degradation and destruction of natural habitats, exploitation for commercial purposes, deforestation, agricultural expansion and grazing, urbanization and industrialization, Forest fires.

### Unit 2:

10

**Wildlife Conservation:** Conservation strategies, Role of NGO's in Conservation, Global and Indian bodies concerned with wildlife conservation, Wildlife conservation projects in India – Project Tiger, Gir Lion sanctuary project, elephant, Musk deer and Crocodile breeding and management project.

### Unit 3:

10

**In situ and ex situ conservation:** Biodiversity and Biodiversity hotspots, Bioreserves, National Parks and Wildlife sanctuaries– their characteristics. Ex situ Conservation: Zoos and their significance – Captive breeding of animals– Zoos, Cryo – preservation, Modern methods of ex situ conservation, Artificial insemination for conservation: Germplasm stations; pollen banks; sperm bank.

### Unit 4:

10

**Wild Life census and Management:** General methods; Census Methods for vertebrate species (Mammals and Birds)

**Wild life management:** Range lands: status, types and management. Case studies (Gudavi and Mandagadde bird sanctuary, Bhadra wildlife sanctuary). Wildlife-Human conflicts.

### Unit 5:

06

**Wild life protection Acts:** Wild life protection Act 1972 and its amendments; Wildlife schedules.

### References:

1. Ali, S. and Ripley S.D. 1969. Handbook of Birds of India and Pakistan, Oxford University.
2. Chatrath, K.J.S. 1992. Wetlands of India, Ashish Publishing House, New Delhi.
3. Heywood, V.H. (Eds) 1995. Global Biodiversity, Published for UN Environmental Programme, Cambridge University Press.
4. Hosetti, B.B. 2006. Concepts in Wildlife Management, Daya Publishing House, Delhi. III edition
5. Hosetti, B.B. and Venkateshwarlu M. 2001. Trends in Wild life, Biodiversity, Conservation, and Management, Daya publishing House, Delhi-35, India. Vol. I and II
6. Hosetti, B.B. 2002. Glimpses of Biodiversity, Daya Publishing House, Delhi-35, India.
7. Stiling, P, 2002. Concepts in Ecology: Theories and Applications IV Ed. Prentice Hall of India Pvt. Ltd., New Delhi-110 001.
8. Khanna, D.R. and P.R.Yadav, 2005. Biology of Birds, Discovery Publishing House, New Delhi 110 002.
9. Sharma, B.B. 1994. High altitude Wildlife of India, IBH Publ. House New Delhi. Ganguly, G. Sinclair and R.E. Anthony, 1994. Wildlife Ecology and Management, Blackwell Scientific Publ. Boston.
10. Negi, S.S. 2002. Hand book of National Parks, Wildlife Sanctuaries and Biosphere reserves in India. Indus Publ., New Delhi.

## **SCT-2.4.c: ORNITHOLOGY**

**48 hrs**

**Unit – 1:** Habitat ecology of birds : Habitat ecology of Indian birds; Coastal birds, Inland water birds, Birds of high altitude and deserts. Distribution of birds in India. Morphometric measurement used in food habit studies.

**06**

**Unit-2:** Feeding ecology of Birds; Insectivores, Frugivores, Nectarivores, Graminivores, Carnivores and Scavengers.

**06**

**Unit-3:** Territoriality; Functions and types of territoriality, sizes and shapes of territory, Defense and site fidelity.

**05**

**Unit-4:** Songs and calls; Functions of voice, birds vocabularies, nature of song, non vocal songs.

**05**

**Unit-5:** Nesting; Functions, choice of nest sites, colonial nesting, forms of nests, nest materials and nest building and multiple nests.

**05**

**Unit-6:** Reproduction; Breeding seasons, Factors influencing breeding seasons, seasonal reproductive cycles, photo periodism, courtship and display, sexual selection, pair bond, sexual dimorphism, mating systems, polyandry, polygyny, promiscuity, co-operative breeding, brood parasites. Egg laying- Timing of egg laying, clutch size, incubation patterns, hatching. Parental care- Feeding, nest sanitation.

**08**

**Unit-7:** Feathers and Moulting – Types, Functions, growth, Moulting.

**04**

**Unit- 8:** Birds Migration; Economic values of birds, endangered and threatened birds.

**05**

**Unit-8:** Field identification tools and techniques, Importance of birds, Modern methods for birds research.

**04**

### **References:**

1. Ali, S and S.D. Ripley. 1969. The Handbook of Birds of India and Pakistan. Oxford University Press – New Delhi
2. Ali, Salim, 1997. The Book of Indian Birds, Oxford University Press, Mumbai.
3. Arora B. M. , 2002. Editor, Indian Wildlife Yearbook, AIZ & WV, Bareilly and Central Zoo Authority, New Delhi.
4. Arora, B.M. 2007. Rehabilitation in free living wild animals . AIZ & WV, Bareilly and Central Zoo Authority, New Delhi.
5. Singh, S.K. 2005. Text Book of Wildlife Management. IBDC, Lucknow.
6. Welty, J. 1982. The Life of Birds. Saunders College Publishing, New York
7. William Sutherland, 1984. Ecological census techniques, Cambridge

**OET-2.9. Offered by the Department of Women's Studies**

## HCT- 3.1: ANIMAL PHYSIOLOGY

48 hrs

### Unit 1: 02

**Introduction:** History and central themes of Animal Physiology and its sub-disciplines

### Unit 2: 10

**Respiration, Blood and Circulation:** Respiration; The atmosphere, solubility of gases, respiratory organs in the vertebrates; Respiratory mechanisms in air breathing fishes, birds and mammals; Respiration in eggs; Blood- Facilitated diffusion, acid-base balance regulation and functions of blood; Circulation- General principle, vertebrate circulation, the physics of flow in tubes.

### Unit 3: 04

**Hormones and Homeostasis:** Calcium glucose; Intermediary metabolism and hormonal regulation; Carbohydrate, nitrogen and lipid; hormones and behavior.

### Unit 4: 08

**Osmoregulation:** Osmotic and other properties of water; Problems of osmoregulation, osmoregulators and conformers; Obligatory exchanges of ion and water; Osmoregulatory organs; Osmoregulation in aqueous and terrestrial animals

### Unit 5: 08

**Feeding and Digestion:** Feeding methods and motility of the alimentary canal; Digestion and gastrointestinal secretions; Absorption and Nutritional requirements; Electron transport system; Energy production (ATP); Efficiency of energy metabolism

### Unit 6: 05

**Thermoregulation:** Classification of animals based on thermal biology; Mechanism of thermoregulation; Neuronal mechanism of temperature control; Thermoregulation and specialized metabolic states

### Unit 7: 05

**Movement:** Mechanism of muscle contraction; Adaptations of muscle for various activities

### Unit 8: 06

**Neurophysiology:** Structure, organization and functions of nervous system; Electrochemical, resting and action potential; Transmission of information within and between neurons; Neurotransmitters; Synapse and postsynaptic neurons; synaptic junction.

### References:

1. Neilsen, K.S. *Animal Physiology: Adaptation and Environment*. IV Ed. Cambridge University Press, 1995.
2. Prakash, M. and arora C.K. *Encyclopedia of Animal Physiology*, Anmol Publications New Delhi, 1998.
3. Pestonjee, D.M. *Stress and Copping*, Sage Publications, London, 1999.
4. Poole, M.C., Pilkey, Grant and Johnson E.C. *Biology in Action*, Harcourt Brace, Canada, 1995.
5. Hoar, W.S. *General and Comparative Animal Physiology*. Prentice Hall Inc., New Delhi, 1983
6. Randall David, Burggren, W and French, K. *Animal Physiology*. W.H. Freeman and Co., New York, 1997.

## HCT-3.2: REPRODUCTIVE BIOLOGY AND ENDOCRINOLOGY

48 hrs

### Unit 1:

02

**Introduction:** Genetic basis of sex determination and differentiation of gonads and gonadal ducts, their hormonal regulation.

### Unit 2:

06

**Male reproduction:** Anatomy of male reproductive system, Histoarchitecture of Testis, Spermatogenesis; Hormonal control of spermatogenesis; Functional role of androgens.

**Male reproductive organs:** Epididymis, Vas-deferens, Prostate gland, Seminal vesicle, Coagulating and Cowper's glands. Biochemistry of semen and Biology of spermatozoa.

### Unit 3:

06

**Female reproduction:** Anatomy of female reproductive system, histoarchitecture of Ovary, Folliculogenesis, Follicular atresia, Ovulation, Luteinisation, and Luteal function. Estrous and Menstrual cycle and its hormonal regulation.

### Unit 4:

08

**Implantation:** Types of Implantation and hormonal regulation. **Placenta:** Types, Endocrine functions of Placenta.

**Gestation:** Corpus luteum, Endocrine control of pregnancy in Rat. Metabolic activity during pregnancy.

**Parturition:** Activation and stimulus of Uterus. Factors involved in Parturition-prostaglandin, Oxytocin, Corticosteroids and other factors.

**Lactation:** Morphological and functional development of Mammary glands and Milk ejection.

### Unit 5:

04

#### **Fertility control:**

Fertility control in male and female: Natural methods, Barrier methods, IUD's, Hormonal contraceptives, surgical methods.

**Reproductive techniques:** IVF, Embryo transfer, Surrogate Mother, Artificial insemination, Intra-Cytoplasmic Sperm Injection (ICSI).

### Unit 6:

02

**Aim and scope of Endocrinology:** Techniques in endocrinology; Hormones as biological signals; Classification of hormones

### Unit 7:

04

**Structure and Biological actions of hormones** of Pituitary, hypothalamus pineal, thyroid, parathyroid, adrenal and pancreas; Neurovascular hypothesis; Endocrine hypothalamus

### Unit 8:

06

**Hormone action:** Hormone receptors- types and structure, regulation; Mechanism of hormone action- peptide hormone, receptor signal transduction, G proteins, other membrane messengers, role of protein kinase C; Mechanism of action of steroid hormones; Calmodulin; Termination of hormone action

### Unit 9:

04

**Biosynthesis and secretion of hormones:** Steroid hormones, catecholamines, thyroid hormones, peptide hormones- Insulin; Hormonal inactivation

### Unit 10:

06

**Growth factors:** Insulin, Prolactin, placental lactogen and IGFs; Neurotrophic growth factors; Hematopoietic growth factors; Epidermal growth factors; Transforming growth factors; Fibroblast growth factors; Cytokines, chalone; Growth factor receptors and cancer

### References:

1. Bentely, P. J. Comparative Vertebrate Endocrinology, III Ed. Cambridge University Press, 1998.
2. Degroot, L. J. and Neill, J. D. (Eds). Endocrinology. Vol. I-III. W. B. Saunders Co., 2001.
3. Knobil, E. and Neill, J. D. (Eds). The Physiology of Reproduction. Vol. I and II. Raven Press Ltd. 1994.
4. Mandal, A Hand Book of Neuroendocrinology. EMKAY Publications, 1994.
5. Turner, C. D. and Bangara, J. T. General and Comparative Endocrinology, 1998.
6. Martin, C. R. Endocrine Physiology. Oxford University Press.
7. Saidapur, S. K. (Ed). Reproductive Cycle of Indian Vertebrates. Alloed Publications Ltd., New Delhi, 1989.

## SCT-3.3a: ANIMAL BEHAVIOUR

48 hrs

### Unit 1:

05

**Animal Behavior:** Introduction, definition and history (Lorenz, Tinbergen, von Frisch); Questions about animal behavior

### Unit 2:

08

**Development of Behavior:** Behavior and genes; Innate behavior; Parent-offspring, Interaction; Imprinting- Filial Imprinting and Sexual imprinting; Instinct- Interaction between instinct and learning; Biological clock; Cultural transmission as a form of behavior and development

### Unit 3:

10

**Learning:** Definition and forms: Habituation; Associative learning/ conditioning (Classical conditioning- Pavlov; Operant conditioning, instrumental learning, Skinner), Spatial learning; Insight learning; Social learning; Cognitive maps; Observational learning/imitation; Insight learning; Social learning; Memory – increased synapses, increased neurons; Memory and cognition

### Unit 4:

09

**Communication:** Sign and normal stimuli; Channels of communication; Pheromones and acoustic signals; Evolution of display and mimicry, aposematic coloration, deception and honesty; communication in social groups, alarm calls, alarm pheromones, trail pheromones; Dance language in honey bee; Primate language

### Unit 5:

08

#### **Evolution of Social system:**

Society, benefits and costs of sociality; Social interactions of groups- Altruism – concept of inclusive fitness, (Kin selection, parental care); Reciprocal Altruism, selfish, spite, conflict and infanticide; Insect eusociality: a case of altruism and cooperation (honey bee); Vertebrate societies; Human sociobiology; Biological and cultural evolution

### Unit 6:

04

**Decision making in animals:** Mechanism of decision making, motivational state; competition, inhibition/disinhibition, decision making on time scale

### Unit 7:

04

Migration in Insects, fishes and birds.

### References:

1. Aubrey, Manning and Marian, S. Dawkins. *An Introduction to Animal Behavior*. Cambridge University, Press, 1995.
2. McFarland, D. *The Oxford Companion to Animal Behavior*
3. McFarland, D. *Animal Behavior Psychology, Ethology and Evolution*. Pitman Publications. 1985,
4. Slater, P. J.B. *Essentials of Animal Behavior*, Cambridge University press, 1999,
5. Krebs, J.R. and Davies, N.B. *An Introduction to Behavioural Ecology-III* (ed). Blackwell Science Ltd., 1993.

## SCT-3.3b: MICROBIOLOGY

48 hrs

### Unit 1:

08

**Introduction:** History of Microbiology, biodiversity, distribution, general classification and distinguishing features of various groups of microorganisms.

### Unit 2:

10

**Isolation and culture of microorganisms:** Principle and technique of isolation; microbial nutrition (types of microbial culture and microbial media), microbial growth, enumeration of microbes and microbial biomass

### Unit 3:

10

**Sterilization techniques:** Physical methods (Dry and wet), Radiation (ionizing and non ionizing), Filtration (porcelain, sintered glass and membrane filters), Chemical methods (Asepsis, disinfection); phenol alcohols: halogens and phenol coefficient).

### Unit 4:

05

**Viruses:** Structure and classification, replication, bacteriophages, life cycle of phage typing, Viroids and prions.

### Unit 5:

05

**Mycoplasma:** Chlamydiae, Rickettsia, their Properties, classification and their role in animal and human diseases.

### Unit 6:

04

**Yeast:** Structure, classification, culture and economic importance.

### Unit 7:

06

**Industrial microbiology:** Importance of bacteria and Yeasts; production of alcohol, microbial pesticides, microbial antibiotics and microbial enzymes

### References:

1. Alexander N. Glazer, Hiroshi Nikaido 1998. Microbial biotechnology. Fundamentals of Applied biotechnology, W.H. Freeman and Company, NY.
2. Edward. 1996, Fundamentals of microbiology, 4<sup>th</sup> edition. The Benjamin/Cumming Publication Corp.
3. Lancing M. Prescott, John P. Harley and Donald A. Klein. 2002. Microbiology. 5<sup>th</sup> edition. McGraw Hill publication. New Delhi.



### **SCT-3.3C: TOXICOLOGY**

**48 hrs**

**Unit 1:** Scope and concept, Basic principles of toxicology

02

**Unit 2:** Principles of bioassay, Dose-response, LC, LD, LT values, EC, ED and ET values, lethal dose, sub-lethal dose. Introduction, Definition of toxicology

08

**Unit 3:** Bio concentration, Biotransformation, Bioaccumulation, Biomagnification, Biomassformation of organophosphates and organochlorines

08

**Unit 4:** Biomonitoring of toxic chemicals

08

**Unit 5:** Heavy metals toxicity, cosmetic toxicity, animal toxin, mycotoxin, plant toxin, biotoxin and their disease

08

**Unit 6:** Smoking aids: Active and Passive smoking, Consumption of tobacco, Marijuana (Ganja), their effects and Prevention measures.

03

**Unit 7:** Risk assessment: Exposure assessment, Dose-Dosage, Risk characterization, Risk analysis and communications, Occupational health and illness.

03

**Unit 8:** Pesticides: Classification of pesticides, Sources and their effects to human, toxicity of Pesticides-viz. Hematotoxicity, Nephrotoxicity, Neurotoxicity, Immunotoxicity and Biopesticides.

08

#### **Reference:**

1. Gorge W. Warne, 1988. Reviews of Environmental contamination of Toxicology, Springer-verlag, New York.
2. Subramanian, M.A. 2004. Toxicology Principles and methods MJP Publishers Chennai.
3. Philip, L. Williams, Robert C. Jawes, Stephen M. Roberts, 2000. Principles of Toxicology, II Ed. A Wiley Science publication John Wiley & Sons. INC. New York.
4. Pandey, K. and J.P. Shukla, 1990. Elements of Toxicology. Radha publ. New Delhi.
5. Bohmont, B.L, 1999. The standard Pesticide user's guide. Prentice hall, PRT, New York.
6. Hassall, K.A. 1990. The Biochemistry and uses Pesticides structure, metabolism and Mode of action and uses in crop protection, John Wiley & Sons. Inc.
7. Hornshy, A.G., Herner, A.E., and Don Wauchope, R. 1995. Pesticide properties in Environment. Springer-verlag, New York.
8. Karmin, M.A., 1997. Pesticide Profiles: Toxicity, Environmental Impacts and Fate. CRC press Ohio, USA.

## OET-3.8: PARASITOLOGY

48hrs

### Unit 1:

2

**Introduction:** Origin and Evolution of Parasitism. Kinds of Hosts and Parasites

### Unit 2:

10

**Pathogenic Microorganisms:** Classification of Microorganisms and structural details; Food and Water borne diseases. Sexually transmitted bacterial diseases. Skin and Wound bacterial diseases.

### Unit 3:

10

**Pathogenic Protozoan's:** Amoebiasis, Giardiasis, Trypanosomiasis, Haemosporidians, Coccidiosis to Poultry; Myxosporians of fishes; Nosema and other pathogenic Protozoa of Insects.

### Unit 4:

07

**Pathogenic Nemetodes;** Etiology of diseases due to *Wuchereria sp*, *Trichinella spiralis* and Hook worms.

### Unit 5:

07

**Pathogenic Trematodes:** Etiology of diseases due to *Fasciola hepatica*, *Fasciolopsis buski* and *Systosoma sp*.

### Unit 6:

07

**Pathogenic Cestodes:** Etiology of diseases due to *Echinococcus*, *Hhymenolepis* and *Diphylobthrium*.

### Unit 7:

05

**Host and parasitic interaction:** physical, chemical and biological; Effect of parasitism on host and parasites.

### References:

1. Hoare, C. A. *Hand Book of Medicinal Protozoology*. London, Baltimore, Tindall and Cox, 1950.
2. Levine, N. D. *Protozoan parasites of Domestic Animals and Man*. II Ed. Minncapolis: Burgess, 1978.
3. Noble, E.R. and Noble, G.A. *Parasitology: The Biology of Animal Parasites*. London Kimpton, 1961
4. Smith, K.G.V. *Insects and other Arthropods of Medical Importance*, London: British Museum of National History. 1973.
5. Soulsby, E.J.L *Biology of Parasites*. New York: Academic Press, 1966.
6. Smyth, J.D. *Introduction to Animal Parasitology*. London: Hodder and Stoughton. 1976.

## **HCT-4.1: ENVIRONMENTAL BIOLOGY**

**48hrs**

### **Unit 1:**

**02**

**Introduction:** Concept, Scope and awareness of environment.

### **Unit 2:**

**10**

**Ecosystems and Productivity:** Types and components, energy flow, food chain and food web; Ecological pyramids, ecological succession.

**Productivity of an ecosystem:** Primary and secondary, productivity of different ecosystems.

### **Unit 3:**

**08**

Natural resources: Concept and classification, Non renewable resources: Mineral, land and soil resources; Renewable resources: Water, forest, wildlife, Agriculture; live stock.

**Energy resources:** Sources and use, declining resource of crude oil, alternative fossil fuels, nuclear energy, solar and other renewable resources; Management strategies of resources

### **Unit 4:**

**08**

**Environmental pollution:** Important episodes of environmental pollution, Water pollution, eutrophication; Air pollution; Greenhouse effect, photochemical smog; Thermal pollution; Noise pollution; Radioactive pollution; Solid waste pollution control.

### **Unit 5:**

**06**

**Climate Change:** Global warming, Ozone layer depletion, Acid rain. Disaster Management: Floods, Earthquake, Tsunami, Cyclones and Land slides.

### **Unit 6:**

**06**

**Human population and environment:** Population growth, population explosion, Age structure, environment and human health; Human rights, value education, Role of information technology in environment and human health

### **Unit 7:**

**08**

Environment and social Issues: Resettlement of Rehabilitation of people; Waste land reclamation; Environmental ethics. Environmental Awareness: Environmental Education-role of educational institutions and other agencies; Environmental legislation and protection Acts.

### **References:**

1. Mckinney, M. L. and Schoh, R. M. environmental Science: System and Solutions, Jones and Bartlett Publishers, 1998.
2. Chapman, J. L. and Reiss, M. J. Ecology: Principles and Applications. Cambridge University Press, 1999.
3. Eldon, D. Enger and Bradley, F. Smith. Environmental Sciences, 1995.
4. Willmer, P., Stone, G. Johnson, I. Environmental Physiology of Animals. Blackwell Science Ltd.
5. Arrora, R. K. Air Pollution, causes and effects, control. Mangaldeep Publications, Jaipur, 1999.
6. Chakraborti, N. K. Environmental Protection and Law. 1994
7. Chikara, M. G. Encyclopedia of Ecology. Environment and Pollution. Vol. I – XIII, 1997.

## **HCT-4.2: PROJECT WORK AND SUBMISSION OF DISSERTATION**

## SCT- 4.3a: EVOLUTIONARY BIOLOGY

48hrs

### Unit 1:

02

**Introduction:** An overview of evolutionary biology.

### Unit 2:

10

**Theories of evolution:** Lamarckism; Natural Selection (Darwinism), contribution of Charles Darwin, Alfred Russel Wallace and Thomas Malthus; Postulates of Natural Selection and evidences; Darwin's finches, Experimental evidences of Natural selection.

### Unit 3:

12

**Neo-Darwinism:** Hardy-Weinberg Law; Genes and genotype frequencies, Concept of Mendelian Population and gene pool; Factors operating against Hardy-Weinberg Law; Types of mutation; Different types of selection; Random Genetic drift (Bottle neck effect, Founder's effect); Migration;

**Molecular polymorphism:** Nucleic acids and proteins; Molecular clock; Neutral theory of evolution and evolution random walk; Forces in evolution- stochastic Vs deterministic

### Unit 4:

05

**Speciation:** Types of species; concept of species; isolating mechanism; prezygotic and post zygotic; Phyletic gradualism and punctuated equilibrium; micro and macroevolution

### Unit 5:

08

**The Evolution of Life histories:** Basic questions in life history evolution; Life history trade-offs: Optimality arguments, age and size at maturation; clutch size and reproductive investment, empirical evidences of life-history trade-offs; Life span and aging; evolutionary theories for aging

### Unit 6:

06

**Impact of Darwin's thoughts in understanding human health and diseases:**

Proximate versus ultimate causes of diseases; Design defects; Defense Mechanisms; Allergy; Evolution of antibiotic / Pesticide resistance; Spread of quirk genes; Evolution of behaviors such as anxiety, fear and depression

### Unit 7:

05

Evolution of Horse, Monkey and Man.

### Reference:

1. Futuyama, D.J. Evolutionary Biology- III Ed. Sinauer Associates Inc. Massachusetts, 1998.
2. Gerhart, J and Kirchner, M. Cell, Embryos & Evolution. Blackwell Science Publishers, 1997.
3. Keynes, R. Charles Darwin's Zoology Notes & Specimen List from H.M.S Beagle. Cambridge University Press, 2000.
4. Price, P.W. Biological Evolution. Saunders College Publishing, 1995.
5. Smith, J.M. Evolutionary Genetics. Oxford University Press, 19

## SCT-4.3 b: BIOINFORMATICS AND BIOSTATISTICS

48 hrs

### Bioinformatics:

#### Unit 1: Computer application

08

Computer: Knowledge of computer systems, hardware and software, CPU and other peripheral devices, software packages, programming language, scientific application of packages.

#### Unit 2:

Internet: The World Wide Web and local area network (LAN), wide area network (WAN).

04

Information retrieval, communication using internet, web data base directories, search engine.

#### Unit 3:

Biological Databases, Bioinformatics tools, Sequence Alignment tool, Database Searching (BLAST, FASTA), Comparative genomics, Structural and Functional genomics in brief.

06

### Biostatistics:

#### Unit 4:

Introduction and scope of Biostatistics. Basic concepts of Biostatistics: Variables, constants, observation, data, population.

04

#### Unit-5:

**Types and collection of data:** Sampling, primary data, Secondary data. Presentation of data:

06

Line diagram, bar diagram, pie diagram, graphic presentation of data.

#### Unit-III

**Measurement of central tendency:** Mean, Median, Mode. Measures of dispersion: Range, Quartile deviation, Mean deviation, Standard deviation, Standard error, Coefficient of variation.

08

#### Unit-IV

**Probability and Probability distribution:** Binomial, poisson and normal distribution.

08

Testing of Hypothesis: Null hypothesis, alternative hypothesis, z test, t test and chi-square test.

#### Unit-V

**Correlation and regression:** Scatter diagram, simple linear regression and non linear

04

regression, correlation and correlation coefficient and application. One way and two way analysis of variance and multivariate analysis of variance.

#### Unit-VI

**Statistical soft ware's:** SPSS, SPAR and MINITAB.

02

### References:

1. A.Malcolm Campbell, Laurie, J. Heyer., (2004): Discovery Genomics, Proteomics, and Bioinformatics: Pearson Education (Singapore) Pte. Ltd.,
2. Arthur, M. Lesk: (2003) Introduction to Bioinformatics: Oxford University Press
3. S.C.Rastogi, N.Mendiratta, P.Rastogi: (2005)- Bioinformatics –Methods and Application: Prentices Hall of India Pvt. Ltd –New Delhi.
4. T.K.Attwood., D.J.Parry-Smith., Samiron Phukan; (2007) – Introduction to Bioinformatics- Pearson Education.
5. Snedecor D.W. and Cochran W.G. 1967. Statistical Methods. Ed. VI. Oxford and IBH Publishing Co., New Delhi.
6. Prasad, S. 2004. Elements of Biostatistics. Rastogi publications. Meerut, India.
7. Robert R. Sokal & James F. Rohlf. 1994. Biometry- The Principles and Practice of Statistics in Biological Research. 3<sup>rd</sup> ed. W. H. Freeman & Company publishers.
8. ZAR, J. H. 1999. Biostatistical analysis, 4<sup>th</sup> ed. Prentice-Hall publications
9. Bailey, N.T.J. 2000. Statistical Methods in Biology. 3<sup>rd</sup> ed. Cambridge University Press. U.K.

## SCT- 4.3.c: ANIMAL BIOTECHNOLOGY

48 hrs

### Unit 1:

02

**Introduction:** Concept and Scope of Biotechnology, Current Status and Future

### Unit 2:

06

**Animal Cell and Tissue Culture:** Definition, Principles of cell and tissue culture; cell lines. Requirement: Equipments, Culture media, Application of cell culture.

**Stem Cell Technology:** Definition, types and properties of stem cells, Differentiation of stem cells, Advantages and Disadvantages of Stem cell technology.

### Unit 3:

06

**Gene Cloning and Gene Transfer Techniques:** Somatic cell nuclear transfer; Recombinant DNA Technology- Molecular tools, Cloning vectors: Gene transfer methods- Microinjection, Electroporation, Polycations, Lipofection, Retroviral infection.

### Unit 4:

06

**Invitro-fertilization, Embryo transfer and cloning in Mammals:** Procedure and limitations of IVF, Embryo Transfer Technique, Cloning of different Mammals.

### Unit 5:

06

**Transgenic animals and Gene Therapy:** Production of transgenic animals, Gene targeting, Knock-out and Knock-in Technology. Transgenic animals- Ethical concerns and Patenting.

Gene therapy: Somatic versus- germ line therapy, Gene therapy in animals.

### Unit 6:

08

**Application of Animal Biotechnology:** Production of regulatory proteins (TRF, GRF, Somatostatin, Somatomedin), epidermal growth factors, Anti-coagulants.

**Recombinant vaccines:** Production of vaccines: DNA vaccines, Monoclonal antibodies, Hybridoma Technology, DNA probes, Biochips, DNA finger printing.

### Unit 7:

04

**Histological and histochemical techniques:** Fixation, embedding, sectioning (microtomy), staining, dehydration, cleaning agents, infiltration, mounting and mountants, Cytological/ histological methods- Enzyme histochemistry, immunohistochemistry

### Unit 8:

04

**Separation techniques:** Chromatography and Gel filtration. Electrophoresis and electro-focusing. Cell fractionation, gradient centrifugation and sub-cellular fractions.

### Unit 9:

06

**Principles and applications of biochemical methods:** RIA, ELISA, DNA sequencing, PCR, GLC, HPLC, Preparation of physiological solutions: Media and Buffers.

Nanotechnology and its Application in Biology

### References:

1. Chirikjian, J.C. *Biotechnology: Theory and Techniques* Vol. I-II. Jones and Bartlett, 1995
2. Glick, B.R. and Pasternak, J.J. *Molecular Biotechnology: Principles and Applications of Recombinant DNA* II (Ed) A.S.M. Press, 1998.
3. Primrose, S.B. *Molecular Biotechnology*- II (Ed). Panima Publishing Corporation, New Delhi/ Bangalore, 2001.
4. Celis, J.E. (Ed) *Cell Biology: A Laboratory Handbook*- Vol. I and II. Academic Press, 1998.
5. Young, S. S. *Computerized data acquisition & Analysis for life Sciences: A Hands-on guide*. Cambridge University Press, 2001.
6. Robert Brown. *Introduction to instrumental analysis*. McGraw RHill International Editions.
7. Wilson, K & Goulding, K.H. *A Biologists Guide to Principles and Techniques of Practical Biochemistry*. ELBS Ed.

## OET-4.6: APPLIED ZOOLOGY

48 hrs

### Unit 1:

02

**Introduction:** Overview and scope of Applied Zoology, Economically important animals.

### Unit 2:

10

**Sericulture:** History of Sericulture. Types of Silk Moths, Rearing methods of Silkworms. Grainage activity, Silk production. Silk worm diseases.

### Unit 3:

08

**Apiculture:** Importance of Bee keeping. Different species of Honey bees and their distribution. Management of Bees, Product and byproduct of Apiculture and their uses.

### Unit 4:

10

**Vermiculture:** Importance of Vermiculture. Types of earthworms, Life cycle of earthworm, Use of Earthworms for biodegradation of organic waste materials, Techniques of Vermiculture, Harvesting of Vermicompost and Vermimass, Vermicompost as Soil Conditioner and Earthworms as source of Protein. Vermiwash.

### Unit 5:

08

**Aquaculture:** Fresh water, Brackish water and Marine fish culture in India, Prawn and Pearl culture, Preservation and Processing of fish; Fish byproducts.

### Unit 6:

05

**Poultry Science:** Introduction, Breeds of fowls, Poultry keeping, Nutritive value of egg and meat, Poultry diseases.

### Unit 7:

05

**Dairy Technology:** Introduction, Breeds of cattle, Breeding and Cattle improvement in India. Nutritive value of Milk and Milk by products.

### References:

1. Srivastava, K.P. *Text Book of Applied Entomology*, Vol. I and II Kalyani Publishers, 1996.
2. Mishra, R.C. *Perspectives in Indian Apiculture*. Allied Scientific Publishers, Bikaner, India, 1999.
3. Lee, K.E. *Earthworms: Their Ecology and Relationship with Soils and Land use* Academic Press. London, 1985.
4. Snathanam, R. Sukumaran, N. and Natarajan, P.: *A Manual of Freshwater Aquaculture*, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1990.
5. Bell, F.W. and Canterbury, E.R. *Aquaculture for Developing Countries- A Feasibility Study*. Cambridge: Ballinger Publishing Co. 1976.

**Akkamahadevi Women's University. Vijayapura**  
**M.Sc. Degree Examination, Nov/ Dec 2018**  
**Subject: Zoology (CBCS)**  
**Theory Model Question Paper**

**Time: 3 Hrs**

**Max. Marks: 70**

**Instructions to the candidates: Answer all the questions; Draw diagrams wherever necessary**

**Part-A**

Q-1 Answer the following questions

1X1 = 10

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

**Part-B**

Answer the following any five questions

12X5 = 60

Q-2

- a)
- b)

Q-3

- a)
- b)

Q-4

- a)
- b)

Q-5

- a)
- b)

Q-6

- a)
- b)

Q-7

- a)
- b)

Q-8

- a)
- b)



**Akkamahadevi Women's University. Vijayapura**  
**M.Sc. Degree Examination, Nov/ Dec 2018**  
**Subject: Zoology (CBCS)**  
**Practical Model Question Paper**

**Time: 3 hrs**

**Max. Marks: 36**

<b>Q. I Major Question</b>	<b>10 marks</b>
<b>Q. II Minor Question</b>	<b>06 marks</b>
<b>Q. III Comment on</b>	<b>5X2=10 marks</b>
<b>Q. IV Viva-voce</b>	<b>05 marks</b>
<b>Q. V Journal /Record</b>	<b>05 marks</b>

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