

KOLHAN UNIVERSITY

CHAIBASA



COURSE CURRICULUM FOR UNDER GRADUATE COURSES UNDER CHOICE BASED CREDIT SYSTEM

B.Sc. Zoology [General]

Upgraded Syllabus

WITH EFFECT FROM 2020

Dr. S. B. Lal (Chairperson)

Dr. Uday Singh (Expert)

Dr. Ravinder Singh

Dr. Anjali Srivastava

Mr. Amar Kumar

Dr. A.P.V.Khalko

CREDIT SCHEME FOR CBCS IN UNDERGRADUATE B.SC. PROGRAMME

Course	Credits	
	Theory + Practical	Theory + Tutorials
I. Core Course (12 Papers) 04 Courses from each of the 03 disciplines of choice	12x4= 48	12x5=60
Core Course Practical / Tutorial (12 Practical/ Tutorials) 04 Courses from each of the 03 Disciplines of choice	12x2=24	12x1=12
II. Elective Course (6 Papers) Two papers from each discipline of choice including paper of interdisciplinary nature.	06x4=24	06x5=30
Elective Course Practical / Tutorials (6 Practical / Tutorials*) Two Papers from each discipline of choice including paper of interdisciplinary nature	06x2=12	06x1=06
III. Ability Enhancement Courses		
1. Ability Enhancement Compulsory Courses (AECC) (2 Papers of 2 credits each) Environmental Science English/MIL Communication	02x02=04	02x02=04
2. Skill Enhancement Courses (SEC) (4 Papers of 2 credits each)	04x02=08	04x02=08
	Total credit = 120	Total credit = 120

SCHEME FOR CBCS IN UNDERGRADUATE B.SC. PROGRAMME

SEMESTER	Core Course (12 Papers)	Ability Enhancement Compulsory Course (AECC) (2 Papers)	Skill Enhancement Course (SEC) (4 Papers)	Discipline Specific Elective (DSE) (6 Papers)
I	DSC 1 A	AECC 1 English/MIL (Hindi) Communication		
	DSC 2 A			
	DSC 3 A			
II	DSC 1 B	AECC 2 Environmental Science		
	DSC 2 B			
	DSC 3 B			
III	DSC 1 C		SEC 1	
	DSC 2 C			
	DSC 3 C			
IV	DSC 1 D		SEC 2	
	DSC 2 D			
	DSC 3 D			
V			SEC 3	DSE 1 A Theory
				DSE 2 A Theory
				DSE 3 A Theory
VI			SEC 4	DSE 1 B Theory
				DSE 2 B Theory
				DSE 3 B Theory

COURSES OF STUDY FOR UNDERGRADUATE 'B.Sc. General' PROGRAMME

Table A-3: Basic Course structure for SCIENCE (Undergraduate Programme)

Total: 120 Credits

Sem	Course (Core Courses)		Allied (Elective Courses)		Ability Enhancement (Compulsory Courses)	
	Code	4 x 3 = 12 Papers	Code	2 x 3 = 6 Papers	Code	1 + 1 + 4 = 6 Papers
I	DSC 1 A DSC 2 A DSC 3 A	Core Subject 1; Paper A Core Subject 2; Paper A Core Subject 3; Paper A			Compulsory Language Communication ENG/ Hindi/ NH + MB	
II	DSC 1 B DSC 2 B DSC 3 B	Core Subject 1; Paper B Core Subject 2; Paper B Core Subject 3; Paper B			EVS	Environmental Science
III	DSC 1 C DSC 2 C DSC 3 C	Core Subject 1; Paper C Core Subject 2; Paper C Core Subject 3; Paper C			SEC 1	SEC 1:
IV	DSC 1 D DSC 2 D DSC 3 D	Core Subject 1; Paper D Core Subject 2; Paper D Core Subject 3; Paper D			SEC 2	SEC 2 of Either Core Subject 1, 2 or 3
V			DSE 1 A DSE 2 A DSE 3 A	Core Subject 1 Core Subject 2 Core Subject 3	SEC 3	SEC 3 of same subject opted in Sem III
VI			DSE 1 B DSE 2 B DSE 3 B	Core Subject 1 Core Subject 2 Core Subject 3	SEC 4	SEC 4 of same subject opted in Sem III

**PROPOSED SYLLABI FOR CHOICE BASED CREDIT SYSTEM
B.Sc. Gen. in Zoology (Six Semester Course)**

SEMESTER-I

Core Course (12 Papers)	Name of Papers	Credit	Total Credit
DSC 1 A	Invertebrates	04	16
DSC 2 A	Vertebrates	04	
DSC 3 A	Practical based in DSC 1 A & DSC 2 A	08	
Ability Enhancement Compulsory Course (AECC) (2 Papers)	AECC 1 English/ MIL(Hindi) Communication	04	04
		Total Credits	20

Semester - II

Core Course (12 Papers)	Name of Papers	Credit	Total Credit
DSC 1 B	Comparative Anatomy	04	16
DSC 2 B	Developmental Biology of Vertebrates	04	
DSC 3 B	Practical based in DSC 1 B & DSC 2 B	08	
Ability Enhancement Compulsory Course (AECC) (2 Papers)	AECC 2 Environmental Science	04	04
		Total Credits	20

Semester -III

Core Course (12 Papers)	Name of Papers	Credit	Total Credit
DSC 1 C	Animal Physiology	04	16
DSC 2 C	Biochemistry	04	
DSC 3 C	Practical based in DSC 1 C & DSC 2 C	08	
Skill Enhancement Course (SEC) (4 Papers)	SEC 1: Sericulture	04	04
		Total Credits	20

Semester -IV

Core Course (12 Papers)	Name of Papers	Credit	Total Credit
DSC 1 D	Genetics and Evolution	04	16
DSC 2 D	Cell Biology and Molecular Biology	04	
DSC 3 D	Practical based in DSC 1 D & DSC 2 D	08	
Skill Enhancement Course (SEC) (4 Papers)	SEC 2: Apiculture	04	04
		Total Credits	20

SEMESTER - V

Discipline Specific Elective (DSE) (6 Papers)	Name of Papers	Credit	Total Credit
DSE 1 A Theory	Animal Biotechnology + Lab	04 + 02	16
DSE 2 A Theory	Zoogeography and Animal Behaviour	04	
DSE 3 A Theory	Immunology + Lab	04 + 02	
Skill Enhancement Course (SEC) (4 Papers)	SEC 3: Pisciculture	04	04
		Total Credits	20

SEMESTER- VI

Discipline Specific Elective (DSE) (6 Papers)	Name of Papers	Credit	Total Credit
DSE 1 B Theory	Reproductive Biology	04 + 02	16
DSE 2 B Theory	Applied Zoology	04 + 02	
DSE 3 B Theory	Project Work	04	
Skill Enhancement Course (SEC) (4 Papers)	SEC 4: Public Health and Hygiene	04	04
		Total Credits	20

GRADES AND GRADE POINTS

LATTER GRADE	GRADE POINT	MARKS PERCENTAGE
O(Outstanding)	10	100%
A++(Excellent)	9	90% to 99.99%
A+(Extremely Good)	8	80% to 89.99 %
A (Very Good)	7.5	75% to 79.99 %
B+(Good)	7	70% to 74.99 %
B(Above Average)	6	60% to 69.99 %
C(Average)	5	50% to 59.99 %
P(Pass)	4	40 % to 49.99 %
F(Fail)	0	Less than 40%
Ab(Absent)	0	

EXAMINATION FRAMEWORK FOR B.Sc. [General]

ESUE

- ❖ There will be a uniform pattern of question for all course and of all the programs . the question pattern will be divided in to three groups .
- ❖ In which **GROUP - I** is objective type and is **COMPULSORY** [10 X 2 = 20].
- ❖ A total of **SEVEN** Question will be set in **group - B** out of which only **FOUR** questions to be attended Consisting of “**05**” marks each .
- ❖ In **GROUP - C** there will be a total of **FOUR** Question and only **TWO** shall have to be answered by the examinees carrying “**15**” marks each .

SIA

- ❖ Written Examination :- **15 Marks**
- ❖ Co-curricular activities and Regularity :- **05 Marks**
- ❖ Project Work / Seasonal Work / Field Study / Viva - Voce :- **10 Marks**

[NOTE :-SIA :-Sessional Internal Assessment & ESUE :- End Semester University Examination]

**PROPOSED SYLLABUS FOR CHOICE BASED CREDIT
SYSTEM
B.Sc. General in Zoology
(Six Semester Course)
1ST SEMETER**

SEMESTER- I**4 Papers**

Total 100 x 4 = 400 Marks**I. ABILITY ENHANCEMENT COMPULSORY COURSE****(AECC 1)****(Credits: Theory-02)**

Any One Compulsory Language Communication Prescribed by Kolhan University: English Communication/ Hindi Communication / NH + MB Communication.

(Refer AECC Curriculum of Kolhan University)

II. CORE COURSE –DSC-A:**(Credits: Theory-04, Practicals-02)**

Marks : 75 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100	Pass Marks: Th ESE = 30 + Pr ESE =10
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Instruction to Question Setter for***End Semester Examination (ESE):***

There will be two groups of questions. Group A is compulsory and will contain two questions. Question No.1 will be very short answer type consisting of ten questions of 1 mark each. Question No.2 will be short answer type of 5 marks. Group B will contain descriptive type six questions of fifteen marks each, out of which any four are to answer.

Note: *There may be subdivisions in each question asked in Theory Examinations.*

DSC 1 A - ANIMAL DIVERSITY**INVERTEBRATES**

Theory: 60 Lectures

Unit 1: Kingdom Protozoa**(4 lectures)**

General characters and classification up to classes; Locomotory Organelles and locomotion in Protozoa, Paramecium and Life Cycle of Entamoeba histolytica.

Unit 2: Phylum Porifera**(3 lectures)**

General characters and classification up to classes; Canal System in Porifera 3

Unit 3: Phylum Ctenophora**(3 lectures)**

General characters and classification up to classes of Coelenterata, Polymorphism in Hydrozoa and Life Cycle of Obelia.

Unit 4: Phylum Platyhelminthes**(3 lectures)**

General characters and classification up to classes; Life history of Taeniasolium, Life Cycle of Fasciola hepatica

Unit 5: Phylum Nematelminthes**(5 lectures)**

General characters and classification up to classes; Life history of Ascaris lumbricoides and its parasitic adaptations

Unit 6: Phylum Annelida**(3 lectures)**

General characters and classification up to classes; Excretion in Annelida

Unit 7: Phylum Arthropoda**(5 lectures)**

General characters and classification up to classes; Vision in Arthropoda, Larval forms of Crustacea, Respiration in Arthropoda

Unit 8: Phylum Mollusca**(4 lectures)**

General characters and classification up to classes; Torsion and Detorsion in gastropods

Unit 9: Phylum Echinodermata**(4 lectures)**

General characters and classification up to classes; Water-vascular system in Asteroidea

DSC 2 A - ANIMAL DIVERSITY**VERTEBRATES****Unit 10: Protochordates****(2 lectures)**

General features and Phylogeny of Protochordata, Hemi, Cephalo and Urochordata, Amphioxus-development of Axolotl Larva.

Unit 11: Pisces**(4 lectures)**

General features and Classification up to orders; Osmoregulation in Fishes

Unit 12: Amphibia**(4 lectures)**

General features and Classification up to orders; Parental care

Unit 13: Reptiles**(4 lectures)**

General features and Classification up to orders; Poisonous and non-poisonous snakes, Biting mechanism in snakes, Rhynchocephalia, Calotes –Respiratory system, Circulatory and Nervous

system

Unit 14: Aves**(5 lectures)**

General features and Classification up to orders; Flight adaptations in birds, Migration, Columba livia - Digestive system, Circulatory systems, Respiratory system and Nervous system.

Unit 15: Mammals**(5 lectures)**

Classification up to orders; Origin and Evolution of mammals, Dentition in mammals, Aquatic adaptations in Mammals.

ZOOLOGY LAB- DSC 3 A- LAB:**60 Lectures****1. Study of the following specimens:****[10 marks]**

Amoeba, Euglena, Plasmodium, Paramecium, Sycon, Hyalonema, and Euplectella, Obelia, Physalia, Aurelia, Tubipora, Metridium, Taeniasolium, Male and female Ascaris lumbricoides, Aphrodite, Nereis, Pheretima, Hirudinaria, Palaemon, Cancer, Limulus, Palamnaeus, Scolopendra, Julus, Periplaneta, Apis, Chiton, Dentalium, Pila, Unio, Loligo, Sepia, Octopus, Pentaceros, Ophiura, Echinus, Cucumaria and Antedon, Balanoglossus, Herdmania, Branchiostoma, Petromyzon, Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla, Ichthyophis/Ureotyphlus, Salamandra, Bufo, Hyla, Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus, Gavialis, Any six common birds from different orders, Sorex, Bat, Funambulus, Loris

2. Study of the following permanent slides:**[10 marks]**

WM of Amoeba, Plasmodium and Paramecium, T.S. and L.S. of Sycon, Study of life history stages of Taenia, T.S. of Male and female Ascaris, TS of Earthworm, Larval form of Earth Crusticia, Gills of Pila, glochidium larvae

3. **Key for Identification of poisonous and non-poisonous snakes.** [10 marks]
4. **Dissection of earthworm, prawn, pila.** [20 marks]
5. **Record.** [05 marks]
6. **Viva- voce.** [05 marks]

SUGGESTED READINGS

1. Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002).
3. The Invertebrates: A New Synthesis, III Edition, Blackwell Science
4. Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.
5. Pough H. Vertebrate life, VIII Edition, Pearson International.
6. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.
7. Pechnek, J.A.2000. Biology of Invertebrates. Tata McGraw-Hill Publishing Company, New Delhi.
8. Kardong, K.V.2002. Vertebrates. Tata McGraw-Hill Publishing Company, New Delhi.
9. S.S.Lal, Zoology Invertebrate and Vertebrate Practical
10. Invertebrate, Kotpal series

**PROPOSED SYLLABUS FOR CHOICE BASED CREDIT
SYSTEM**
B.Sc. General in Zoology
(Six Semester Course)
2ND SEMETER

SEMESTER- II**4 Papers**

Total 100 x 4 = 400 Marks**I. ABILITY ENHANCEMENT COMPULSORY COURSE
(AECC)**

(Credits: Theory-02)

Marks : 100 (ESE: 3Hrs) =100**Pass Marks Th ESE = 40***Instruction to Question Setter for**End Semester Examination (ESE):*

There will be **objective type test** consisting of hundred questions of 1 mark each. Examinees are required to mark their answer on **OMR Sheet** provided by the University.

AECC 2 – ENVIRONMENTAL STUDIES**Theory: 30 Lectures****Unit 1 : Introduction to environmental studies****(2 lectures)**

Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development.

Unit 2 : Ecosystems**(2 lectures)**

What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems:

Forest Ecosystem

Grassland Ecosystem

Desert Ecosystem

Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 3 : Natural Resources : Renewable and Non-renewable Resources (5 lectures)

Land resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.

Water: Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter--state).

Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit 4 : Biodiversity and Conservation (3 lectures)

Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots

India as a mega-biodiversity nation; Endangered and endemic species of India

Threats to biodiversity: Habitat loss, poaching of wildlife, man--wildlife conflicts, biological invasions; Conservation of biodiversity: In--situ and Ex--situ conservation of biodiversity.

Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 5 : Environmental Pollution (5 lectures)

Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution, Nuclear hazards and human health risks, Solid waste management: Control measures of urban and industrial waste. Pollution case studies.

Unit 6 : Environmental Policies & Practices (5 lectures)

Climate change, global warming, ozone layer depletion, acid rain and impacts

on human communities and agriculture

Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).

Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Unit 7 : Human Communities and the Environment**(4 lectures)**

Human population growth: Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected persons; case studies. Disaster management: floods, earthquake, cyclones and landslides. Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Unit 8 : Field work**(Equal to 4 lectures)**

Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.

Visit to a local polluted site--Urban/Rural/Industrial/Agricultural.

Study of common plants, insects, birds and basic principles of identification.

Study of simple ecosystems--pond, river, Chaibasa, etc.

SUGGESTED READINGS

1. Raziuddin, M., Mishra P.K. 2014, *A Handbook of Environmental Studies*, Akanaksha Publications, Ranchi.
2. Mukherjee, B. 2011: *Fundamentals of Environmental Biology*. Silverline Publications, Allahabad.
3. Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
4. Gadgil, M., & Guha, R.1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
5. Gleeson, B. and Low, N. (eds.) 1999. *Global Ethics and Environment*, London, Routledge.
6. Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
7. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. *Principles of Conservation Biology*.
8. Sunderland: Sinauer Associates, 2006. Grumbine, R. Edward, and Pandit, M.K. 2013.
9. 4Threats from India's Himalaya dams. *Science*, 339: 36-37. McCully, P. 1996.
10. *Rivers no more: the environmental effects of dams*(pp. 29-64). Zed Books.
11. McNeill, John R. 2000. *Something New Under the Sun: An Environmental History of the Twentieth Century*.

12. Odum, E.P., Odum, H.T. & Andrews, J. 1971. *Fundamentals of Ecology*. Philadelphia: Saunders.
13. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. *Environmental and Pollution Science*. Academic Press.
14. Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
15. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. *Environment*. 8th edition. John Wiley & Sons.
16. Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. Tripathi 1992.
17. Sengupta, R. 2003. *Ecology and economics: An approach to sustainable development*. OUP.
18. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
19. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology: Voices from the Tropics*.
20. John Wiley & Sons.
21. Thapar, V. 1998. *Land of the Tiger: A Natural History of the Indian Subcontinent*.
22. Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
23. Wilson, E. O. 2006. *The Creation: An appeal to save life on earth*. New York: Norton.
24. World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University

II. CORE COURSE –DSC-B:

(Credits: Theory-04, Practicals-02)

Marks : 75 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100

Pass Marks: Th ESE = 30 + Pr ESE =10

Instruction to Question Setter for

End Semester Examination (ESE):

There will be **two** groups of questions. **Group A is compulsory** and will contain two questions. **Question No.1 will be very short answer type** consisting of ten questions of 1 mark each. **Question No.2 will be short answer type** of 5 marks. **Group B will contain descriptive type** six questions of fifteen marks each, out of which any four are to answer.

Note: There may be subdivisions in each question asked in Theory Examinations.

DSC 1 B- COMPARATIVE ANATOMY

Total Theory: 60 Lectures

Unit 1: Integumentary System	(4 Lectures)
Derivatives of integument w.r.t. glands and digital tips	
Unit 2: Respiratory System	(5 Lectures)
Brief account of Gills, lungs, air sacs and swim bladder	
Unit 3: Circulatory System	(5 Lectures)
Evolution of heart and aortic arches	
Unit 4: Urinogenital System	(8 Lectures)
Succession of kidney, Evolution of urinogenital ducts	
Unit 5: Nervous System	(4 Lectures)
Comparative account of brain	
Unit 6: Sense Organs	(4 Lectures)
Types of receptors	

DSC 2 B- DEVELOPMENTAL BIOLOGY OF VERTEBRATES**Unit 7: Early Embryonic Development (12 Lectures)**

Gametogenesis: Spermatogenesis and oogenesis w.r.t. mammals, vitellogenesis in birds; Fertilization: external (amphibians), internal (mammals), blocks to polyspermy; Early development of frog and humans (structure of mature egg and its membranes, patterns of cleavage, fate map, up to formation of gastrula); types of morphogenetic movements; Fate of germ layers; Neurulation in frog embryo.

Unit 8: Late Embryonic Development (10 Lectures)

Implantation of embryo in humans, Formation of human placenta and functions, other types of placenta on the basis of histology; Metamorphic events in frog life cycle and its hormonal regulation.

Unit 9: Control of Development (8 Lectures)

Fundamental processes in development (brief idea) – Gene activation, determination, induction, Differentiation, morphogenesis, intercellular communication, cell movements and cell death.

ZOOLOGY LAB-DSC 3 B - LAB**60 Lectures**

SPOTTING.....[30 marks]

1. Osteology:

- a) Disarticulated skeleton of fowl and rabbit
- b) Carapace and plastron of turtle /tortoise
- c) Mammalian skulls: One herbivorous and one carnivorous animal.

2. Frog - Study of developmental stages - whole mounts and sections through permanent slides

- Cleavage stages, blastula, gastrula, neurula, tail bud stage, tadpole external and internal gill stages.

3. Study of the different types of placenta- histological sections through permanent slides or photomicrographs.

4. Study of placental development in humans by ultrasound scans.
5. Examination of gametes - frog/rat - sperm and ova through permanent slides or photomicrographs.

DISSECTION.....[20 marks]

6. Dissection of Afferent and Efferent arterial system of the Scholiodon
7. Dissection of bony fishes and accessory respiratory organs.
8. Record. [05 marks]
9. Viva- voce. [05 marks]

SUGGESTED READINGS

1. Kardong, K.V. (2005) Vertebrates' Comparative Anatomy, Function and Evolution. IV Edition. Mc Graw- Hill Higher Education.
2. Hilderbrand, M and Gaslow G.E. Analysis of Vertebrate Structure, John Wiley and Sons.
3. Walter, H.E. and Sayles, L.P; Biology of Vertebrates, Khosla Publishing House.
4. Gilbert, S. F. (2006). Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
5. Balinsky, B.I. (2008). An introduction to Embryology, International Thomson Computer Press.
6. E.L.Jordan and P.S. Verma 'Chordate Zoology' -. S. Chand Publications.
7. Mohan P.Arora. 'Chordata –I, Himalaya Publishing House Pvt.Ltd.
8. Marshal, Parker and Haswell 'Text book of Vertebrates'. ELBS and McMillan, England.

9. Alfred Sherwood Romer. Thomas S. Pearson 'The Vertebrate Body, Sixth edition, CBS college Publishing, Saunders College Publishing
10. George C. Kent, Robert K. Carr. Comparative Anatomy of the Vertebrates, 9th ed. McGraw Hill.
11. J.W. Young, The Life of Vertebrates, 3rd ed, Oxford University press.
12. Harvey Pough F, Christine M. Janis, B. Heiser, Vertebrate Life, Pearson, 6th ed, Pearson Education Inc.2002.

ZOOLOGY GENERAL

**PROPOSED SYLLABUS FOR CHOICE BASED CREDIT
SYSTEM**

B.Sc. General in Zoology

(Six Semester Course)

3RD SEMETER

ZOOLOGY GENERAL

SEMESTER- III**4 Papers**

Total 100 x 4 = 400 Marks**I. SKILL ENHANCEMENT COURSE SEC 1:****(Credits: Theory-02)**

1. All Four Papers (One paper to be studied in each semester) of any One Subject to be opted from either of the Core Subjects opted for General Courses of Study.

(Refer Content from the Syllabus of opted Skill Enhancement Course Subject.)**II. CORE COURSE –DSC-C:****(Credits: Theory-04, Practicals-02)****Marks : 75 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100****Pass Marks: Th ESE = 30 + Pr ESE =10*****Instruction to Question Setter for******End Semester Examination (ESE):***

There will be two groups of questions. Group A is compulsory and will contain two questions.

Question No.1 will be very short answer type consisting of ten questions of 1 mark each. Question No.2 will be short answer type of 5 marks. Group B will contain descriptive type six questions of fifteen marks each, out of which any four are to answer.

Note: *There may be subdivisions in each question asked in Theory Examinations.*

DSC 1 C : ANIMAL PHYSIOLOGY**Total Theory: 60 Lectures****Unit 1: Nerve and muscle (8 Lectures)**

Structure of a neuron, resting membrane potential, Graded potential, Origin of Action potential and its propagation in myelinated and non-myelinated nerve fibers, Ultra-structure of skeletal muscle, Molecular and chemical basis of muscle contraction

Unit 2: Digestion (5 Lectures)

Physiology of digestion in the alimentary canal; Absorption of carbohydrates, proteins, lipids

Unit 3: Respiration (5 Lectures)

Pulmonary ventilation, Respiratory volumes and capacities, Transport of Oxygen and carbon dioxide in blood in mammals.

Unit 4: Excretion (5 Lectures)

Structure of nephron, Mechanism of Urine formation, Counter-current Mechanism in mammals.

Unit 5: Cardiovascular system (5 Lectures)

Composition of blood, Hemostasis, Structure of Heart, Origin and conduction of the cardiac impulse, cardiac cycle.

Unit 6: Reproduction and Endocrine Glands (7 Lectures)

Physiology of male reproduction: hormonal control of spermatogenesis; Physiology of female reproduction: hormonal control of menstrual cycle in mammals. Structure and function of

pituitary, thyroid, Parathyroid, pancreas and adrenal.

DSC 2 C - BIOCHEMISTRY

Unit 7: Carbohydrate Metabolism

(8 Lectures)

Glycolysis, Krebs cycle, Pentose phosphate pathway, Gluconeogenesis, Glycogen Glyc metabolism, Review of electron transport chain

Unit 8: Lipid Metabolism

(5 Lectures)

Biosynthesis and β oxidation of palmitic acid

Unit 9: Protein metabolism

(6 Lectures)

Transamination, Deamination and Urea Cycle

Unit 10: Enzymes and Homeostasis

(6 Lectures)

Introduction, Mechanism of action, Enzyme Kinetics, Inhibition and Regulation, Concept of Homeostasis, Mechanism of Homeostasis, Osmoregulation -Water and ionic regulation by freshwater, brackish water and marine animals

ZOOLOGY LAB-DSC 3 C- LAB

60 Lectures

SPOTTING[30 marks]

1. Preparation of hemin and hemochromogen crystals
2. Study of permanent histological sections of mammalian pituitary, thyroid, pancreas, adrenal gland
3. Study of permanent slides of spinal cord, duodenum, liver, lung, kidney, bone, cartilage

ESTIMATION OF PROTEIN, FATS & CARBOHYDRATES.....[10 marks]

4. Qualitative identify functional groups of carbohydrates in given solutions

(Glucose, Fructose, Sucrose, Lactose)

5. Estimation of total protein in given solutions by Lowry's method.

6. E.S.R. & Haemocytometer

7. Staining & preparation of permanent slides.

[10 marks]

8. Record.

[05 marks]

9. Viva- voce.

[05 marks]

SUGGESTED READINGS

1. Tortora, G.J. and Derrickson, B. H. (2009). *Principles of Anatomy and Physiology*, XII Edition, John Wiley & Sons, Inc.
2. Widmaier, E.P., Raff, H. and Strang, K.T. (2008) *Vander's Human Physiology*, XI Edition., McGraw Hill
3. Guyton, A.C. and Hall, J.E. (2011). *Textbook of Medical Physiology*, XII Edition, Harcourt Asia Pvt. Ltd/ W.B. Saunders Company
4. Berg, J.M., Tymoczko, J.L. and Stryer, L.(2006). *Biochemistry*. VI Edition.
5. W.H Freeman and Co. Nelson, D.L., Cox, M. M. and Lehninger, A.L.(2009). *Principles of Biochemistry*. IV Edition.
6. W.H. Freeman and Co. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009). *Harper's Illustrated Biochemistry*. XXVIII Edition. Lange Medical Books/ McGraw3Hill.

SEC 1- SKILL ENHANCEMENT COURSE: SERICULTURE

Objectives: To train and impart knowledge of Mulberry and silkworm, their culture practices, maintenance and management practices. Entrepreneur motivation for practicing sericulture as small scale cottage industry.

Unit: I

- 1.1. History and economic importance of sericulture –types of silkworm –Mulberry and non-Mulberry (Tassar, Eri and Muga).
- 1.2. Systematic position of Bombyx and Life Cycle -Morphology of silk gland.
- 1.3. Horticulture –mulberry cultivation –Environmental conditions for mulberry cultivation – soil, climatic factors, preparation of land.
- 1.4. Inter-cultivation –pruning methods –harvesting
- 1.5. Diseases and pests of mulberry and control methods.

Unit: II

- 2.1. Silkworm rearing –general principles of silkworm rearing –primary requisite for successful rearing.
- 2.2. Feeding of silkworm, bed cleaning, sparing, moulting, late age silkworms –Moulting and harvesting economics of silkworm.
- 2.3. Diseases and pests of silkworm.
- 2.4. Reeling –reeling appliances and process of reeling cocoons.
- 2.5. Sericulture as cottage industry.

SUGGESTED READINGS

1. Handbook of sericulture –S.R. Ullal and M. N. Varasimhanna
2. An introduction to sericulture –G. Ganga, J. Sulochana Chetty
3. Manual of Sericulture –FA O Volumes.

ZOOLOGY GENERAL

**PROPOSED SYLLABUS FOR CHOICE BASED CREDIT
SYSTEM**

B.Sc. General in Zoology

(Six Semester Course)

4TH SEMETER

SEMESTER- IV**4 Papers**

Total 100 x 4 = 400 Marks**I. SKILL ENHANCEMENT COURSE SEC 2:****(Credits: Theory-02)**

1. All Four Papers (One paper to be studied in each semester) of any One Subject to be opted from either of the Core Subjects opted for General Courses of Study.

(Refer Content from the Syllabus of opted Skill Enhancement Course Subject.)**II. CORE COURSE –DSC-D:****(Credits: Theory-04, Practicals-02)****Marks : 75 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100****Pass Marks: Th ESE = 30 + Pr ESE =10*****Instruction to Question Setter for******End Semester Examination (ESE):***

There will be two groups of questions. Group A is compulsory and will contain two questions.

Question No.1 will be very short answer type consisting of ten questions of 1 mark each. Question No.2 will be short answer type of 5 marks. Group B will contain descriptive type six questions of fifteen marks each, out of which any four are to answer.

Note: *There may be subdivisions in each question asked in Theory Examinations.*

DSC 1 D : GENETICS AND EVOLUTION**Total Theory: 60 Lectures****Unit 1: Introduction to Genetics (2 Lectures)**

Mendel's work on transmission of traits, Genetic Variation, Molecular basis of Genetic Information

Unit2: Mendelian Genetics and its Extension (6 Lectures)

Principles of Inheritance, Chromosome theory of inheritance, Incomplete dominance and co- dominance, Multiple alleles, lethal alleles, Epistasis, Pleiotropy, sex linked inheritance, extra- chromosomal inheritance

Unit 3: Linkage, Crossing Over and Chromosomal Mapping (6 Lectures)

Linkage and crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence, Somatic cell genetics-an alternative approach to gene mapping

Unit 4: Mutations (5 Lectures)

Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy; Gene mutations: Induced versus Spontaneous mutations, Back versus Suppressor mutations,

Unit 5: Sex Determination (3 Lectures)

Chromosomal mechanisms, dosage compensation

Unit 6: Introduction to Evolutionary Theories (3 Lectures)

Lamarckism, Darwinism, Neo-Darwinism

Unit 7: Evidences of Evolution (3 Lectures)

Types of fossils, Incompleteness of fossil record, Dating of fossils, Phylogeny of horse

Unit 8: Processes of Evolutionary Change**(4 Lectures)**

Organic variations; Isolating Mechanisms; Natural selection (Example: Industrial melanism); Types of natural selection (Directional, Stabilizing, Disruptive), Artificial selection

Unit 9: Macro-evolution**(4 Lectures)**

Macro-evolutionary Principles (example: Darwin's Finches)

Unit 10: Extinction**(4 Lectures)**

Mass extinction (Causes, Names of five major extinctions, Role of extinction in evolution)

DSC 2 D: CELL BIOLOGY AND MOLECULAR BIOLOGY**Unit 11: Cell Biology****(10 Lectures)**

Cell theory, Differences of Prokaryotic and Eukaryotic cells, Ultrastructure of animal cell, Structure and functions of plasma membrane proteins, Structure and functions of cell organelles – Endoplasmic reticulum, Golgi body, Ribosomes, Lysosomes, centrosomes, Mitochondria and Nucleus, Chromosomes –Structure, types, giant chromosomes, Cell Division -Mitosis, Meiosis, Cell cycle and its regulation.

Unit 11: Molecular Biology**(10 Lectures)**

DNA (Deoxyribo Nucleic Acid) –Structure, RNA (Ribo Nucleic Acid) -Structure, types, DNA Replication, Protein Synthesis –Transcription and Translation, Gene Expression – Genetic Code; operon concept, Molecular Biology Techniques-Polymerase Chain Reaction, Electrophoresis

ZOOLOGY LAB –DSC-D LAB**60 Lectures**

1. Study of Mendelian Inheritance and gene interactions (Non Mendelian)

- Inheritance) using suitable examples. Verify the results using Chi-square test.
2. Study of Linkage, recombination, gene mapping using the data.
 3. Study of Human Karyotypes (normal and abnormal).
 4. Study of fossil evidences from plaster cast models and pictures
 5. Study of homology and analogy from suitable specimens/ pictures
 6. Charts:
 - a) Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horse ancestors
 - b) Darwin's Finches with diagrams/ cut outs of beaks of different species
 7. Visit to Natural History Museum and submission of report
 8. Drosophila Salivary gland, Grasshopper testis, Chironomous larva.
 9. Study of polytene chromosomes from Chironomus / drosophila larvae.
 10. Preparation of liquid culture medium (LB) and raise culture of E. coli.
 11. Estimation of the growth kinetics of E. coli by turbidity method.
 12. Preparation of solid culture medium (LB) and growth of E. coli by spreading and streaking.
 13. Demonstration of antibiotic sensitivity/resistance of E. coli to antibiotic pressure and interpretation of results.
 14. Quantitative estimation of salmon sperm/calf thymusDNA using colorimeter (Diphenylamine reagent) or spectrophotometer (A260 measurement).
 15. Quantitative estimation of RNA using Orcinol reaction.
 16. Study and interpretation of electron micrographs/ photograph showing
 17. DNA replication
 18. Transcription
 19. Split genes.
 20. Record. **[05 marks]**
 21. Viva- voce. **[05 marks]**

SUGGESTED READINGS

1. Gardner, E.J., Simmons, M.J., Snustad, D.P.(2008). *Principles of Genetics*. VIII Edition. Wiley India.
2. Snustad, D.P., Simmons, M.J.(2009). *Principles of Genetics*. V Edition. John Wiley and Sons Inc.
3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). *Concepts of Genetics*. X Edition.
4. Benjamin Cummings.Russell, P. J. (2009).*Genetics- A Molecular Approach*. III Edition.
5. Benjamin Cummings.Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. *Introduction to Genetic Analysis*. IX Edition. W. H. Freeman and Co
6. Ridley, M. (2004). *Evolution*. III Edition. Blackwell Publishing
7. Barton, N.H., Briggs, D.E.G., Eisen, J.A., Goldstein, D.B. and Patel, N.H. (2007). *Evolution*. Cold Spring, Harbour Laboratory Press.
8. Hall, B.K. and Hallgrimsson, B. (2008). *Evolution*. IV Edition.
9. Jones and Bartlett Publishers Campbell, N.A. and Reece J. B. (2011). *Biology*. IX Edition,
10. Pearson, Benjamin, Cummings. Douglas, J. Futuyma (1997). *Evolutionary Biology*. Sinauer Associates.
11. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). *The World of the Cell*. VII Edition.
12. Pearson Benjamin Cummings Publishing, San Francisco.

13. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter: Molecular Biology of the Cell, IV Edition.
14. Cooper G. M. and Robert E. Hausman R. E. The Cell: A Molecular Approach, V Edition, ASM Press and Sinauer Associates.
15. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
16. Karp, G. (2010) Cell and Molecular Biology: Concepts and Experiments. VI Edition. John Wiley and Sons. Inc.
17. Lewin B. (2008). Gene XI, Jones and Bartlett.

ZOOLOGY GENERAL

SEC 2- SKILL ENHANCEMENT COURSE: APICULTURE

Objectives: To train and impart knowledge of Mulberry and silkworm, their culture practices, maintenance and management practices. Entrepreneur motivation for practicing sericulture as small scale cottage industry.

Unit 1: Biology of Bees

History, Classification and Biology of Honey Bees Social Organisation of Bee Colony

Unit 2: Rearing of Bees

Artificial Bee rearing (Apiary), Beehives-Newton and Langstroth, Bee Pasturage Selection of Bee Species for Apiculture, Bee Keeping Equipment, Methods of Extraction of Honey (Indigenous and Modern)

Unit 3: Diseases and Enemies

Bee Diseases and Enemies, Control and Preventive measures

Unit 4: Bee Economy

Products of Apiculture Industry and its Uses (Honey, Bees Wax, Propolis), Pollen etc

Unit 5: Entrepreneurship in Apiculture

Bee Keeping Industry – Recent Efforts, Modern Methods in employing artificial Bee hives for cross pollination in horticultural gardens.

SUGGESTED READINGS

1. Singh S., *Bee keeping in India*, Indian council of Agricultural Research, New Delhi.
2. Prost, P.J.(1962). *Apiculture*. Oxford and IBH, New Delhi.
3. Bisht D.S., *Apiculture*, ICAR Publication

ZOOLOGY GENERAL

**PROPOSED SYLLABUS FOR CHOICE BASED CREDIT
SYSTEM
B.Sc. General in Zoology
(Six Semester Course)
5TH SEMETER**

SEMESTER- V**4 Papers**

Total 100 x 4 = 400 Marks**I. SKILL ENHANCEMENT COURSE SEC 3:****(Credits: Theory-02)**

All Four Papers (One paper to be studied in each semester) of any One Subject to be opted from either of the Core Subjects opted for General Courses of Study.

(Refer Content from the Syllabus of opted Skill Enhancement Course Subject.)

II. DISCIPLINE SPECIFIC ELECTIVE -DSE-A:**(Credits: Theory-04, Practicals-02)****Marks : 75 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100****Pass Marks: Th ESE = 30 + Pr ESE =10*****Instruction to Question Setter for******End Semester Examination (ESE):***

There will be two groups of questions. Group A is compulsory and will contain two questions.

Question No.1 will be very short answer type consisting of ten questions of 1 mark each. Question No.2 will be short answer type of 5 marks. Group B will contain descriptive type six questions of fifteen marks each, out of which any four are to answer.

Note: *There may be subdivisions in each question asked in Theory Examinations.*

SEC 3 - SKILL ENHANCEMENT COURSE: PISCICULTURE

Unit 1: Scope of Aquaculture. Importance of cultivable fresh water, marine ornamental species.

Unit 2: Fish farm Maintenance – Farm management technique, water quality, temperature and accessories in Farm management viz Aerator, Filter, paddler

Unit 3: Fish culture technique, Monoculture, Polyculture and monosex culture, Induced fish breeding, Integrated fish farming

Unit 4: Fish nutrition and fish formulations live fish live fish transport.

Unit 5: Prevention and control of fish diseases.

ZOOLOGY GENERAL

DSE 1 A THEORY - ANIMAL BIOTECHNOLOGY

Unit 1: Introduction

Concept and scope of Biotechnology

Unit 2: Molecular Techniques in Gene manipulation

Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophage, M13, BAC, YAC, MAC and Expression vectors (characteristics) Restriction enzymes: Nomenclature, detailed study of Type II. Transformation techniques: Calcium chloride method and electroporation. Construction of genomic and cDNA libraries and screening by colony and plaque hybridization Southern, Northern and Western blotting; DNA sequencing: Sanger method Polymerase Chain Reaction, DNA Finger Printing and DNA micro array

Unit 3: Genetically Modified Organisms

Production of cloned and transgenic animals: Nuclear Transplantation, Retroviral Method, DNA microinjection

Applications of transgenic animals: Production of pharmaceuticals, production of donor organs, knockout mice.

Production of transgenic plants: *Agrobacterium* mediated transformation.

Applications of transgenic plants: insect and herbicide resistant plants.

Unit 4: Culture Techniques and Applications

Animal cell culture, Expressing cloned genes in mammalian cells, Molecular diagnosis of genetic diseases (Cystic fibrosis, Sickle cell anemia). Recombinant DNA in medicines: Recombinant insulin and human growth hormone, Gene therapy

ZOOLOGY LAB –DSE 1 A- LAB

60 Lectures

-
1. Genomic DNA isolation from *E. coli*
 2. Plasmid DNA isolation (pUC 18/19) from *E. coli*
 3. Restriction digestion of plasmid DNA.
 4. Construction of circular and linear restriction map from the data provided.
 5. Calculation of transformation efficiency from the data provided.
 6. To study following techniques through photographs
 - a) Southern Blotting
 - b) Northern Blotting
 - c) Western Blotting
 - d) DNA Sequencing (Sanger's Method)
 - e) PCR
 - f) DNA fingerprinting

7. Project report on animal cell culture
8. Record [5 marks]
9. Viva – Voce [5 marks]

SUGGESTED READINGS

1. Brown, T.A. (1998). *Molecular Biology Labfax II: Gene Cloning and DNA Analysis*. II Edition, Academic Press, California, USA.
2. Glick, B.R. and Pasternak, J.J. (2009). *Molecular Biotechnology - Principles and Applications of Recombinant DNA*. IV Edition, ASM press, Washington, USA.
3. Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009). *An Introduction to Genetic Analysis*. IX Edition. Freeman and Co., N.Y., USA.
4. Snustad, D.P. and Simmons, M.J. (2009). *Principles of Genetics*. V Edition, John Wiley and Sons Inc.
5. Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007). *Recombinant DNA-Genes and Genomes- A Short Course*. III Edition, Freeman and Co., N.Y., USA.
6. Beauchamp, T.I. and Childress, J.F. (2008). *Principles of Biomedical Ethics*. VI Edition, Oxford University Press.

DSE 2 A THEORY - ZOOGEOGRAPHY AND ANIMAL BEHAVIOUR

ZOOGEOGRAPHY:

Zoogeographical regions –Palearctic, Nearctic, Neotropical, Oriental, Australian and Ethiopian regions –their Climatic and faunal peculiarities, Wallace line, Discontinuous distribution, Continental Drift

ANIMAL BEHAVIOUR:

Types of Behaviour-Innate and Acquired, Instinctive and Motivated behaviour, Taxes, Reflexes, Tropisms, Physiology and phylogeny of learning, trial and error learning, Imprinting, habituation, Classical conditioning, Instrumental conditioning, Social behaviour, Communication, Pheromones, Biological rhythms, Biological clocks, Circadian rhythms

DSE 3 A THEORY - IMMUNOLOGY

UNIT-1 . Introduction to Immunity

UNIT-2. Cell and organs of immune system

- 2.1. Types of immune cells, lymphoid and myeloid
- 2.2. Primary and secondary lymphoid organs .

UNIT-3. Humoral immunity

- 3.1. Antigen
- 3.2. Function of B cell

UNIT- 4. Cell mediated immunity

Function of T-Cells

UNIT- 5. Antibodies

5.1. Structure**5.2. Classes and function of antibodies****5.3. Monoclonal antibodies****5.4. Antigen antibody interaction as tools for research and diagnosis.****UNIT- 6. Working of the immune system**

Structure and function of MHC , Exogenous and endogenous pathways of antigen presentation and processing, Basic properties and function of Cytokines , Complement system : Components and pathways .

UNIT- 7. Vaccines

General introduction to vaccines , various types of vaccines .

ZOOLOGY LAB –DSE 3 A LAB**60 Lectures**

-
- 1*. Demonstration of lymphoid organs
 2. Histological study of spleen, thymus and lymph nodes through slides/ photographs
 3. Preparation of stained blood film to study various types of blood cells.
 4. Ouchterlony's double immuno-diffusion method.
 5. ABO blood group determination.
 - 6*. Cell counting and viability test from splenocytes of farm bred animal's/cell lines.
 7. Demonstration of
 - a) ELISA
 - b) Immunoelectrophoresis

(*Subject to UGC guidelines)

SUGGESTED READINGS

1. Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006).
Immunology, VI Edition. W.H. Freeman and Company.
2. David, M., Jonathan, B., David, R. B. and Ivan R. (2006). *Immunology*,
VII Edition, Mosby, Elsevier Publication.
3. Abbas, K. Abul and Lechtman H. Andrew (2003.) *Cellular and Molecular
Immunology*. V Edition. Saunders Publication.

ZOOLOGY GENERAL

**PROPOSED SYLLABUS FOR CHOICE BASED CREDIT
SYSTEM
B.Sc. General in Zoology
(Six Semester Course)
6TH SEMETER**

SEMESTER- VI**4 Papers**

Total 100 x 4 = 400 Marks**I. SKILL ENHANCEMENT COURSE SEC 4:****(Credits: Theory-02)**

All Four Papers (One paper to be studied in each semester) of any One Subject to be opted from either of the Core Subjects opted for General Courses of Study.

(Refer Content from the Syllabus of opted Skill Enhancement Course Subject.)

II. DISCIPLINE SPECIFIC ELECTIVE - (DSE-B):**(Credits: Theory-04, Practicals-02)****Marks : 75 (ESE: 3Hrs) + 25 (Pr 3Hrs)=100****Pass Marks: Th ESE = 30 + Pr ESE =10*****Instruction to Question Setter for******End Semester Examination (ESE):***

There will be two groups of questions. Group A is compulsory and will contain two questions.

Question No.1 will be very short answer type consisting of ten questions of 1 mark each. Question No.2 will be short answer type of 5 marks. Group B will contain descriptive type six questions of fifteen marks each, out of which any four are to answer.

Note: *There may be subdivisions in each question asked in Theory Examinations.*

**SKILL ENHANCEMENT COURSE SEC 4: PUBLIC HEALTH
AND HYGIENE**

1. Medical fitness–Determine the following: BMI, Blood Pressure, Cholesterol (LDL, HDL)
Hemoglobin Complete Blood Picture; Complete urine examination
 2. Qualitative identification of carbohydrates, Lipids, vitamins, lipids and minerals,
 3. Estimation of fat content and tests milk adulteration.
 4. Qualitative and quantitative survey methods in public health sciences.
 5. Identification of parasitic stages of malaria and filaria through permanent slides
 6. Estimation of blood glucose level in normal and diabetic persons.
 7. Project report on Epidemiological survey, different diseases such as Malaria; Chicken gunya; AIDS, Diarrhoea
 8. Epidemiological survey of a slum area to identify the diseases due to poor sanitation and contaminated drinking water.
 9. Visit to a community water purification and treatment plant.
 10. Visit to an industry to study occupational health hazard and safety of industrial workers (sugar/milk dairy/textile/cement).
 11. Visit to agricultural fields to study occupational health of farmers and agricultural laborers.
- **Laboratory Record work shall be submitted at the time of practical examination**
 - **Computer aided techniques should be adopted as per UGC guide lines**

PUBLIC HEALTH AND HYGIENE (PRACTICAL)

1. Epidemiological survey report of a slum area health status
2. Estimation of ----- from food or water or milk
3. Project work
4. Certified practical record
5. Viva-Voce

ZOOLOGY GENERAL

DSE 1 B THEORY : REPRODUCTIVE BIOLOGY

Unit 1: Reproductive Endocrinology

Gonadal hormones and mechanism of hormone action, steroids, glycoprotein hormones, and prostaglandins, hypothalamo – hypophyseal – gonadal axis, regulation of gonadotrophin secretion in male and female; Reproductive System: Development and differentiation of gonads, genital ducts, external genitalia, mechanism of sex differentiation.

Unit 2: Functional anatomy of male reproduction

Outline and histological of male reproductive system in rat and human; Testis: Cellular functions, germ cell, stem cell renewal; Spermatogenesis: kinetics and hormonal regulation; Androgen synthesis and metabolism; Epididymal function and sperm maturation; Accessory glands functions; Sperm transportation in male tract.

Unit 3: Functional anatomy of female reproduction

Outline and histological of female reproductive system in rat and human; Ovary: folliculogenesis, ovulation, corpus luteum formation and regression; Steroidogenesis and secretion of ovarian hormones; Reproductive cycles (rat and human) and their regulation, changes in the female tract; Ovum transport in the fallopian tubes; Sperm transport in the female tract, fertilization; Hormonal control of implantation; Hormonal regulation of gestation, pregnancy diagnosis, foeto – maternal relationship; Mechanism of parturition and its hormonal regulation; Lactation and its regulation.

Unit 4: Reproductive Health

Infertility in male and female: causes, diagnosis and management; Assisted Reproductive Technology: sex selection, sperm banks, frozen embryos, in vitro fertilization, ET, EFT, IUT, ZIFT, GIFT, ICSI, PROST; Modern contraceptive technologies; Demographic terminology used in family planning.

ZOOLOGY LAB –DSE 1 B LAB**60 Lectures**

1. Study of animal house: set up and maintenance of animal house, breeding techniques, care of normal and experimental animals.
2. Examination of vaginal smear rats from live animals.
3. Surgical techniques: principles of surgery in endocrinology. Ovaryectomy, hysterectomy, castration and vasectomy in rats.
4. Examination of histological sections from photomicrographs/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems; Sections of ovary, fallopian tube, uterus (proliferative and secretory stages), cervix and vagina.
5. Human vaginal exfoliate cytology.
6. Sperm count and sperm motility in rat
7. Study of modern contraceptive devices

SUGGESTED READINGS

1. Austin, C.R. and Short, R.V. reproduction in Mammals. Cambridge University Press.
2. Degroot, L.J. and Jameson, J.L. (eds). Endocrinology. W.B. Saunders and Company.
3. Knobil, E. et al. (eds). The Physiology of Reproduction. Raven Press Ltd.
4. Hatcher, R.A. et al. The Essentials of Contraceptive Technology. Population Information Programme.

DSE 2 B THEORY : APPLIED ZOOLOGY

Unit 1: Introduction to Host-parasite Relationship

Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Zoonosis

Unit 2: Epidemiology of Diseases

Transmission, Prevention and control of diseases: Tuberculosis, typhoid

Unit 3: Parasitic Protozoa

Life history and pathogenicity of Entamoeba histolytica, Plasmodium vivax and Trypanosoma gambiense

Unit 4: Parasitic Helminthes

Life history and pathogenicity of *Ancylostoma duodenale* and *Wuchereria bancrofti*

Unit 5: Insects of Economic Importance

Biology, Control and damage caused by *Helicoverpa armigera*, *Pyrrilla perpusilla* and *Papilio demoleus*, *Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum*

Unit 6: Insects of Medical Importance

Medical importance and control of *Pediculus humanus corporis*, *Anopheles*, *Culex*, *Aedes*, *Xenopsylla cheopis*

Unit 7: Animal Husbandry

Preservation and artificial insemination in cattle; Induction of early puberty and synchronization of estrus in cattle

Unit 8: Poultry Farming

Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs

Unit 09: Fish Technology

Genetic improvements in aquaculture industry; Induced breeding and transportation of fish seed

ZOOLOGY LAB –DSE 2 B LAB**60 Lectures**

-
1. Study of *Plasmodium vivax*, *Entamoeba histolytica*, *Trypanosoma gambiense*, *Ancylostoma duodenale* and *Wuchereria bancrofti* and their life stages through permanent slides/photomicrographs or specimens.

2. Study of arthropod vectors associated with human diseases: Pediculus, Culex, Anopheles, Aedes and Xenopsylla.
3. Study of insect damage to different plant parts/stored grains through damaged products/photographs.
4. Identifying feature and economic importance of Helicoverpa (Heliothis) armigera, Papilio demoleus, Pyrrilla perpusilla, Callosobruchus chinensis, Sitophilus oryzae and Tribolium castaneum
5. Visit to poultry farm or animal breeding centre. Submission of visit report.
6. Maintenance of freshwater aquarium

SUGGESTED READINGS

1. Park, K. (2007). *Preventive and Social Medicine*. XVI Edition. B.B Publishers.
2. Arora, D. R and Arora, B. (2001). *Medical Parasitology*. II Edition. CBS Publications and Distributors.
3. Kumar and Corton. *Pathological Basis of Diseases*.
4. Atwal, A.S. (1986). *Agricultural Pests of India and South East Asia*, Kalyani Publishers.
5. Dennis, H. (2009). *Agricultural Entomology*. Timber Press (OR).
6. Hafez, E. S. E. (1962). *Reproduction in Farm Animals*. Lea & Fabiger Publisher
7. Dunham R.A. (2004). *Aquaculture and Fisheries Biotechnology Genetic Approaches*. CABI publications, U.K.
8. Pedigo, L.P. (2002). *Entomology and Pest Management*, Prentice Hall.

DSE-3 B: - PROJECT WORK

Credit-4

Teaching Hrs -60

The objective of this paper is to inculcate the trait of independent investigation, the student shall work (approximately 60 study hours) on some topic related to his / her area of specialization or related to his / her broader area of study. He / she shall write a project report preferably independently or in association with faculty members of the Department.

Two examiners shall evaluate the project. A written test one-hour duration relating to the project shall be taken.

ZOOLOGY GENERAL

MARKS DISTRIBUTION

a) Project Preparation through Power Point	40
b) Written Test	40
c) Viva - Voce	20

INSTRUCTIONS

The project report should contain all necessary data and at the same time it should be brief and to the points.

A project report /dissertation include usually following chapters-

1. Introduction /Theoretical background.
2. Review of related literature.
3. Methodology (materials and methods)
4. Data collection
5. Analysis of data
6. Discussion of results and findings of study.
7. Bibliography.
8. Appendix

THANK YOU!

ZOOLOGY GENERAL