SCHEME OF EXAMINATION

AND

COURSE OF STUDY

CHOICE BASED CREDIT SYSTEM

B.Sc. Zoology

(w. e. f. 2021-2022)

DEPARMENT OF ZOOLOGY AND ENVRIONMENTAL SCIENCES
GURUKULA KANGRI (DEEMED TO BE UNIVERSITY),
HARIDWAR – 249404, (UTTARAKHAND), INDIA

OCTOBER 2021

S.N.	Subject Code	Subject Title	Period			Evaluation Scheme			Subject Total
						Sessional		ESE	
			L	P	Credit	CT	TA		
B. Sc. I Year									
Semester – I									
DSC 1	BZO-C 101	Animal diversity	4		4	20	10	70	100
	BZO-C 151	Practical	-	4	4	15	15	70	100
Semester –II									
DSC 2	BZO –C 201	Comparative anatomy and developmental biology	4	-	4	20	10	70	100
	BZO –C 251	Practical	-	4	4	15	15	70	100
				Total	**16**				**400**
B.Sc. II Year									
Semester-III									
DSC 3	BZO –C 301	Physiology & Biochemistry	4	-	4	20	10	70	100
SEC 1	BZO –S 302	Aquatic Biology	2	-	2	20	10	70	100
	BZO –C 351	Practical	-	4	4	15	15	70	100
Semester –IV									
DSC 4	BZO –C 401	Genetics & Evolutionary Biology	4	-	4	20	10	70	100
SEC 2	BZO –S 402	Apiculture	2	-	2	20	10	70	100
	BZO –C 451	Practical	-	4	4	15	15	70	100
						Total 20			**600**
B.Sc. III Year									
Semester –V									
DSE1	BZO –E 501	Applied Zoology	4	-	4	20	10	70	100
SEC 3	BZO –S 502	Sericulture	2	-	2	20	10	70	100
	BZO –C 551	Practical	-	4	4	15	15	70	100
Semester –VI									
DSE-2	BZO –C 601	Reproductive Biology	4	-	4	20	10	70	100
SEC 4	BZO –C 602	Public health and hygiene	2	-	2	20	10	70	100
	BZO –C 651	Practical	-	4	4	15	15	70	100
			Total		**20**				**600**
			Credit Total		**56**	**Grand Total**			**1600**

SEMESTER- I

Core Course: Zoology: DSC-01

BZO-C 101: ANIMAL DIVERSITY
(Credits: Theory-4, Practicals-4)
THEORY

Lectures: 60 **M.M.: 70**

UNIT-I

Phylums: Protista: General characters and classification up to classes; Locomotory Organelles and locomotion in Protozoa: **Porifera:** General characters and classification up to classes; Canal System in *Sycon:* **Cnidaria:** General characters and classification up to classes; Polymorphism in Hydrozo: **Platyhelminthes:** General characters and classification up to classes; Life history of *Taenia solium: (12 Lectures)*

UNIT-II

Phylums: Nemathelminthes: General characters and classification up to classes; Life history of *Ascaris lumbricoides* and its parasitic adaptations: A**nnelida:** General characters and classification up to classes; Metamerism in Annelida: **Arthropoda:** General characters and classification up to classes; Vision in Arthropoda, Metamorphosis in Insects. *(12 Lectures)*

UNIT-III

Phylums: Mollusca: General characters and classification up to classes; Torsion in Gastropods**: Echinodermata:** General characters and classification up to classes Water-vascular system in Asteroidea: **Protochordates:** General features and Phylogeny of Protochordata: *(12 Lectures)*

UNIT-IV

Agnatha: General features of Agnatha and classification of cyclostomes up to classes
Phylums: Pisces: General features and Classification up to orders; Osmoregulation: **Amphibia:** General features and Classification up to orders; Parental care. *(12 Lectures)*

UNIT-IV

Reptiles: General features and Classification up to orders; Poisonous and nonpoisonous, snakes, Biting mechanism in snakes: **Aves:** General features and Classification up to orders; Flight adaptations: **Mammals:** Classification up to orders; Origin of mammals. *(12 Lectures)*

Note: The question paper shall consist of two sections (A & B). Section A shall contain ten short answer type questions of six marks each and student has to attempt any five questions in about 150 words each. Section B shall consist eight long answer type questions of ten marks each and student shall be required to attempt any four questions in detail. Questions shall be uniformly distributed from the entire syllabus. The previous year paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

SUGGESTED READINGS

1. Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition. Holt Saunders International Edition.

2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science

3. Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson

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.

PRACTICAL: BZO-C 151

M.M.:70

Kingdom: Protista: *Amoeba*, *Euglena, Plasmodium, Paramecium*

Phylum: Porifera: *Sycon* (including T.S. and L.S.), *Hyalonema,* and *Euplectella*

Phylum: Cnidaria: *Obelia, Physalia, Aurelia, Tubipora, Metridium*

Phylum: Platyhelminthes: *Taenia solium* and Study of its life history stages

Phylum: Nemathelminthes: Male and female *Ascaris lumbricoides*

Phylum: Annelida: *Aphrodite, Nereis, Pheretima, Hirudinaria*

Phylum: Arthropoda: *Palaemon, Cancer*, *Limulus*, *Palamnaeus, Scolopendra*, *Julus*, *Periplaneta, Apis*

Phylum: Mollusca: *Chiton, Dentalium, Pila, Unio, Loligo, Sepia, Octopus*

Phylum: Echinodermata: *Pentaceros, Ophiura, Echinus, Cucumaria* and *Antedon*

Protochordata: *Balanoglossus, Herdmania, Branchiostoma*

Agnatha: *Petromyzon*

Pisces: *Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla*

Amphibia: *Ichthyophis/Ureotyphlus, Salamandra, Bufo, Hyla*

Reptilia: *Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus, Gavialis*

Key for Identification of poisonous and non-poisonous snakes

Aves: Study of six common birds from different orders

Mammalia: *Sorex*, Bat, *Funambulus, Loris*

An "**animal album**" containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose. These need not be repeated as drawings by the album maker.

SEMESTER-II

Core Course: Zoology: DSC-02

BZO-C 201: COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES

(Credits: Theory-4, Practicals-4)

THEORY

Lectures: 60 **M.M.: 70**

UNIT-I

Integumentary System: Derivatives of integument w.r.t. glands and digital tips; **Skeletal System:** Evolution of visceral arches; **Digestive System:** Brief account of alimentary canal and digestive glands; **Respiratory System:** Gills, lungs, air sacs and swim bladder. *(12 Lectures)*

UNIT-II

Circulatory System: Evolution of heart and aortic arch; **Urinogenital System:** Succession of kidney, Evolution of urinogenital ducts. *(10 Lectures)*

UNIT-III

Nervous System: Comparative account of brain; **Sense Organs:** Types of receptors *(10 Lectures)*

UNIT-IV

Early embryonic development: Gametogenesis: Spermatogenesis and oogenesis in 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. *(14 Lectures)*

UNIT-V

Late embryonic development: Implantation of embryo in humans, Formation of human placenta and functions, other types of placentae on the basis of histology; Metamorphic events in frog life cycle and its hormonal regulation.; **Control of Development:** Fundamental processes in development (brief idea) – Gene activation, determination, induction, Differentiation, morphogenesis, intercellular communication, cell movements and cell death *(14 Lectures)*

Note: The question paper shall consist of two sections (A & B). Section A shall contain ten short answer type questions of six marks each and student has to attempt any five questions in about 150 words each. Section B shall consist eight long answer type questions of ten marks each and student shall be required to attempt any four questions in detail. Questions shall be uniformly distributed from the entire syllabus. The previous year paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

SUGGESTED READINGS: COMPARATIVE ANATOMY

1. Kardong, K.V. (2005) *Vertebrates' Comparative Anatomy, Function and Evolution*. IV Edition. McGraw-Hill Higher Education.

2. Kent, G.C. and Carr R.K. (2000). *Comparative Anatomy of the Vertebrates*. IX Edition. The McGraw-Hill Companies.

3. Weichert C.K and William Presch (1970). *Elements of Chordate Anatomy*, Tata McGraw Hills

4. Hilderbrand, M and Gaslow G.E. *Analysis of Vertebrate Structure*, John Wiley and Sons.

5. Walter, H.E. and Sayles, L.P; *Biology of Vertebrates*, Khosla Publishing House.

B. DEVELOPMENTAL BIOLOGY

SUGGESTED READINGS

1. Gilbert, S. F. (2006). Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.

2. Balinsky, B.I. (2008). An introduction to Embryology, International Thomson Computer Press.

3. Carlson, Bruce M (1996). Patten's Foundations of Embryology, McGraw Hill, Inc.

BZO-C 251: PRACTICAL

M.M.:70

A. COMPARATIVE ANATOMY

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.

B. DEVELOPMENTAL BIOLOGY

1.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.

2. Study of the different types of placentae- histological sections through permanent slides or photomicrographs.

3. Study of placental development in humans by ultrasound scans.

4. Examination of gametes - frog/rat - sperm and ova through permanent slides or photomicrographs.

SEMESTER –III

Core Course: Zoology: DSC-03
BZO-C 301: PHYSIOLOGY AND BIOCHEMISTRY
(Credits: Theory-4, Practicals-4)
THEORY

Lectures: 60 **M.M.: 70**

UNIT-I

Nerve and muscle: Structure of a neuron, Resting membrane potential, Graded potential, Origin of Action potential and its propagation in myelinated and non-myelinated nerve fibres, Ultrastructure of skeletal muscle, Molecular and chemical basis of muscle contraction. (12 Lectures)

UNIT-II

Digestion: Digestion in different segments of the alimentary canal; Absorption of carbohydrates, proteins, lipids: **Respiration:** Pulmonary ventilation, Respiratory volumes and capacities, Transport of Oxygen and carbon dioxide in blood. (12 Lectures)

UNIT-III

Excretion: Structure of nephron, mechanism of Urine formation; **Cardiovascular system**
Blood: Composition, Hemostasis, Heart structure, Origin and conduction of the cardiac impulse, cardiac cycle. (12 Lectures)

UNIT-IV

Reproduction and Endocrine Glands: Physiology of male reproduction: hormonal control of spermatogenesis; Physiology of female reproduction: hormonal control of menstrual cycle; Structure and function of pituitary, thyroid, parathyroid, pancreas and adrenal. (12 Lectures)

UNIT-V

Carbohydrate Metabolism: Glycolysis, Krebs Cycle, Pentose phosphate pathway, Gluconeogenesis, Glycogen metabolism, Review of electron transport chain: **Lipid Metabolism:** Biosynthesis and β oxidation of palmitic acid: **Protein metabolism:** Transamination, Deamination and Urea Cycle: **Enzymes:** Introduction, Mechanism of action, Kinetics, Inhibition and Regulation. (12 Lectures)

Note: The question paper shall consist of two sections (A & B). Section A shall contain ten short answer type questions of six marks each and student has to attempt any five questions in about 150 words each. Section B shall consist eight long answer type questions of ten marks each and student shall be required to attempt any four questions in detail. Questions shall be uniformly distributed from the entire syllabus. The previous year paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

SUGGESTED READINGS: PHYSIOLOGY

1. Tortora, G.J.& Derrickson, B.H. (2009). Principles of Anatomy and Physiology, 12th edn., John Wiley & Sons, Inc.

2. Widmaier, E.P., Raff, H. & Strang, K.T. (2008) Vander's Human Physiology, 11th edn., McGraw Hill

3. Guyton, A.C. & Hall, J.E. (2011) Textbook of Medical Physiology, 12th edn., Harcourt Asia Pvt. Ltd/ W.B. Saunders Company

SUGGESTED READINGS: BIOCHEMISTRY

1. Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H Freeman and Co.

2. Nelson, D. L., Cox, M. M. and Lehninger, A.L. (2009) . Principles of Biochemistry. IV Edition. W.H Freeman and Co.

3. Murray, R. K., Granner, D. K., Mayes, P. A. and Rodwell, V. W. (2009). Harper's Illustrated Biochemistry. XXVIII Edition. Lange Medical Books/Mc Graw3Hill.

SEMESTER –III

CBCS: B.Sc. Zoology (SEC)
SKILL ENHANCEMENT COURSES- SEC-01
BZO-S 302: AQUATIC BIOLOGY
(Credits 2)
THEORY

Lectures: 30 Max. Marks: 70

UNIT-I

Aquatic Biomes: Brief introduction of the aquatic biomes: Freshwater ecosystem (lakes, wetlands, streams and rivers), estuaries, intertidal zones, oceanic pelagic zone, marine benthic zone and coral reefs.

UNIT-II

Freshwater Biology Lakes: Origin and classification, Lake as an Ecosystem, Lake morphometry, River & Streams: Types, Different type of river basin Different stages of stream development.

UNIT-III

Physico–chemical Characteristics: Light, Temperature, Thermal stratification, pH, Dissolved Solids, Carbonate, Bicarbonates, Phosphates and Nitrates, Turbidity; dissolved gases (Oxygen, Carbon dioxide). Nutrient Cycles in Lakes-Nitrogen, Sulphur and Phosphorous.

UNIT-IV

Marine Biology: Types of Oceans, Salinity and density of Sea water, Continental shelf, Adaptations of deep-sea organisms, Coral reefs, Sea weeds.

UNIT-V

Management of Aquatic Resources: Causes of pollution- Agricultural, Industrial, Sewage, Thermal and Oil spills, Eutrophication, Management and conservation (legislations), Water quality assessment- DO, BOD and COD, Sewage treatments. Aquatic biodiversity- Plankton, Benthos & Hill stream fishes.

Note: The question paper shall consist of two sections (A & B). Section A shall contain ten short answer type questions of six marks each and student has to attempt any five questions in about 150 words each. Section B shall consist eight long answer type questions of ten marks each and student shall be required to attempt any four questions in detail. Questions shall be uniformly distributed from the entire syllabus. The previous year paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

SUGGESTED READINGS

1. Luke Holt (2018). Aquatic Biology. www.calisttoreference.com

2. W. T. Edmondson (1959). Freshwater Biology. John Wiley & Sons Inc.

3. B.B. Hosetti and Arvind Kumar (2016). A Text Book of Aquatic Biology. ASTRAL Publisher. www.astralint.com

4. Philip V. Mladenov (2013). Marine Biology: A Very Short Introduction. OXFORD University Press.

5. T. T. Macan and E. B. Worthington (2012). Life in Lakes and Rivers. Collins Publisher.

PRACTICAL- BZO-C 351

M.M.: 70

A. PHYSIOLOGY

1. Preparation of hemin and hemochromogen crystals

2. Examination of permanent histological sections of mammalian pituitary, thyroid, parathyroid, pancreas, adrenal,

3. Examination of permanent slides of spinal cord, duodenum, liver, lung, kidney, bone, cartilage

B. BIOCHEMISTRY

1. Identification of unknown carbohydrates in given solutions (Starch, Sucrose, Lactose, Galactose, Glucose, Fructose)

2. Colour reactions to identify functional group in the given solution of proteins

3. Study of activity of salivary amylase under optimum conditions

SEMESTER-IV

Core Course: Zoology: DSC-04
BZO-C 401: GENETICS AND EVOLUTIONARY BIOLOGY
(Credits: Theory-4, Practicals-4)
THEORY

Lectures: 60 **M.M.: 70**

UNIT-I

Introduction to Genetics: Mendel's work on transmission of traits, Genetic Variation, Molecular basis of Genetic Information; **Mendelian Genetics and its Extension:** Principles of Inheritance, Chromosome theory of inheritance, Pedigree analysis, Incomplete dominance and codominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Environmental effects on phenotypic expression, sex linked inheritance, extrachromosomal inheritance involving mitochondria and chloroplast. (12 Lectures)

UNIT-II

Linkage, Crossing Over and Chromosomal Mapping: Linkage and crossing over, Cytological basis of crossing over, Molecular mechanism of 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. (12 Lectures)

UNIT-III

Mutations: Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy; Gene mutations: Induced versus Spontaneous mutations, Back versus Suppressor mutations, Molecular basis of Mutations; **Sex determination;** Chromosomal mechanisms, dosage compensation; **Quantitative Genetics:** Quantitative and multifactor inheritance, Transgressive variations, Heterosis. (12 Lectures)

UNIT-IV

History of Life: Major Events in History of Life; **Introduction to Evolutionary Theories:** Lamarckism, Darwinism, Neo-Darwinism; **Direct Evidences of Evolution:** Types of fossils, Incompleteness of fossil record, Dating of fossils, Phylogeny of horse: **Processes of Evolutionary Change:** Organic variations; Isolating Mechanisms; Natural selection (Example: Industrial melanism); Types of natural selection (Directional, Stabilizing, Disruptive), Artificial selection. (12 Lectures)

UNIT-V

Species Concept: Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric); **Evolution above species level:** Macro-evolutionary Principles (example: Darwin's Finches); **Extinction:** Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of extinction in evolution. (12 Lectures)

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SUGGESTED READINGS: GENETICS

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. Benjamin Cummings.

4. Russell, P. J. (2009). *Genetics- A Molecular Approach.* III Edition. Benjamin Cummings.

5. 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.

SUGGESTED READINGS: EVOLUTIONARY BIOLOGY

1. Ridley, M. (2004). *Evolution*. III Edition. Blackwell Publishing

2. Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007). E*volution*. Cold Spring, Harbour Laboratory Press.

3. Hall, B. K. and Hallgrimsson, B. (2008). *Evolution*. IV Edition. Jones and Bartlett Publishers

SEMESTER-IV

SKILL ENHANCEMENT COURSES- SEC-02
BZO-S 402: APICULTURE
(Credits 2)
THEORY

Lectures: 30 **M.M.: 70**

UNIT-I

Apiculture: History – Biology and classification of honey bee species of honey bees Social organization of honey bee colony. (04 Lectures)

UNIT-II

Bee hive: Flora for apiculture – Selection of bees for apiculture, Method of bee Keeping – Indigenous method of Extraction of honey. (06 Lectures)

UNIT-III

Modern method of apiculture: Appliances for modern method. Diseases of Honey bee and control measures. (08 Lectures)

UNIT-IV

Products of bee keeping: Honey – Bee wax and Bee Yeman – Honey: Production, Chemical composition – Economic importance of Honey bee wax. (06 Lectures)

UNIT-V

Bee enemies: Bee keeping industry – Recent efforts – Modern method in employing honey bees for cross pollination in horticultural gardens. (06 Lectures)

Note: The question paper shall consist of two sections (A & B). Section A shall contain ten short answer type questions of six marks each and student has to attempt any five questions in about 150 words each. Section B shall consist eight long answer type questions of ten marks each and student shall be required to attempt any four questions in detail. Questions shall be uniformly distributed from the entire syllabus. The previous year paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

PRACTICAL – BZO-C 451

M.M.: 70

A. GENETICS

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).

B. EVOLUTIONARY BIOLOGY

1. Study of fossil evidences from plaster cast models and pictures

2. Study of homology and analogy from suitable specimens/ pictures

3. 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

4. Visit to Natural History Museum, submission of report

SEMESTER- V

Discipline Specific Elective Zoology DSE 1
BZO-E 501: APPLIED ZOOLOGY
(Credits: Theory-4, Practicals-4)
THEORY

Lectures: 60 **M.M.: 70**

UNIT-I

Introduction to Host-parasite Relationship and Epidemiology of Diseases: Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Zoonosis, Transmission, Prevention and control of diseases: Tuberculosis, swine flu, typhoid, Rickettsiae and Spirochaetes, Brief account of *Rickettsia prowazekii*, *Borrelia recurrentis* and *Treponema pallidum*. (14 Lectures)

UNIT-II

Parasitic Protozoa and Helminthes: Life history and pathogenicity of *Entamoeba histolytica*, *Plasmodium vivax* and *Trypanosoma gambiense*, Life history and pathogenicity of *Schistosoma haematobium*, *Ancylostoma duodenale* and, *Wuchereria bancrofti*. (12 Lectures)

UNIT-III

Insects of Economic and Medical Importance: Biology, Control and damage caused by *Helicoverpa armigera*, *Pyrilla perpusilla* and *Papilio demoleus*, *Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum*; Safe storage of stored grains, Life cycle, medical importance and control of Pediculus humanus corporis, Anopheles, Culex, Aedes, Xenopsylla cheopis, Phlebotomus argentipes. (14 Lectures)

UNIT-IV

Animal Husbandry and Poultry Farming: Preservation and artificial insemination in cattle; Induction of early puberty and synchronization of estrus in cattle, Principles of poultry breeding, Management of breeding stock and broilers, Processing and, preservation of eggs. (12 Lectures)

UNIT-V

Fish Technology: Genetic improvements in aquaculture industry; Induced breeding and transportation of fish seed. (08 Lectures)

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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.

SEMESTER-V

SKILL ENHANCEMENT COURSES - SEC -03
BZO-S 502: SERICULTURE
(Credits 2)
THEORY

Lectures: 30 **M.M.: 70**

UNIT-I

Classification of commercial varieties of mulberry. Mulberry plantation establishment and cultivation practices. (04 Lectures)

UNIT-II

Diseases of mulberry – Fungal, bacterial, viral and Nematode diseases, Deficiency diseases and their remedial measures. (08 Lectures)

UNIT-III

Silkworm rearing operations – Chawki rearing and Late age rearing techniques. (04 Lectures). (08 Lectures)

UNIT-IV

Physical and commercial characters of cocoons. Reeling operations, Importance of by-products of Sericulture. (05 Lectures)

UNIT-V

Economics of Sericulture – Future and progress of Sericulture Industry in India. Prospects of Sericulture as Self-Employment venture. (04 Lectures)

Note: The question paper shall consist of two sections (A & B). Section A shall contain ten short answer type questions of six marks each and student has to attempt any five questions in about 150 words each. Section B shall consist eight long answer type questions of ten marks each and student shall be required to attempt any four questions in detail. Questions shall be uniformly distributed from the entire syllabus. The previous year paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

BZO-C 551 PRACTICAL

M.M.: 70

1. Study of permanent slides/photomicrographs and specimens of *Plasmodium vivax*, *Entamoeba histolytica*, *Trypanosoma gambiense*, *Schistosoma haematobium*, Ancylostoma duodenale and Wuchereria bancrofti

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*, *Pyrilla 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

SEMESTER- VI

Discipline Specific Elective Zoology -DSE-02

BZO-E 601: REPRODUCTIVE BIOLOGY

(Credits: Theory-4, Practicals-4)

THEORY

Lectures: 60 **M.M.: 70**

UNIT-I

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. (12 Lectures)

UNIT-II

Functional anatomy of male reproduction: Outline and histological of male reproductive system in rat and human; Testis: Cellular functions, germ cell, system cell renewal; Spermatogenesis: kinetics and hormonal regulation; Androgen synthesis and metabolism; Epididymal function and sperm maturation; Accessory glands functions; Sperm transportation in male tract. (12 Lectures)

UNIT-III

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; (12 Lectures)

UNIT-IV

Hormonal control of implantation; Hormonal regulation of gestation, pregnancy diagnosis, foeto – maternal relationship; Mechanism of parturition and its hormonal regulation; Lactation and its regulation. (12 Lectures)

UNIT-V

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. (12 Lectures)

Note: The question paper shall consist of two sections (A & B). Section A shall contain ten short answer type questions of six marks each and student has to attempt any five questions in about 150 words each. Section B shall consist eight long answer type questions of ten marks each and student shall be required to attempt any four questions in detail. Questions shall be uniformly distributed from the entire syllabus. The previous year paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

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.

SEMESTER-VI

SKILL ENHANCEMENT COURSES -SEC-04
BZO-S 602: PUBLIC HEALTH AND HYGIENE
(Credits 2)
THEORY

Lectures: 30 **M.M.: 70**

UNIT-I

Scope of Public health and Hygiene – nutrition and health – classification of foods – Nutritional deficiencies - Vitamin deficiencies. (08 Lectures)

UNIT-II

Environment and Health hazards – Environmental degradation. (06 Lectures)

UNIT-III

Environmental Pollutions and associated health hazards. (04 Lectures)

UNIT-IV

Communicable diseases and their control measures such as Measles, Polio, Chikungunya, Rabies, Plague, Leprosy and AIDS. (06 Lectures)

UNIT_V

Non-Communicable diseases and their preventive measures such as Hypertension, Coronary Heart diseases, Stroke, Diabetes, Obesity and Mental ill-health. (06 Lectures)

Note: The question paper shall consist of two sections (A & B). Section A shall contain ten short answer type questions of six marks each and student has to attempt any five questions in about 150 words each. Section B shall consist eight long answer type questions of ten marks each and student shall be required to attempt any four questions in detail. Questions shall be uniformly distributed from the entire syllabus. The previous year paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

PRACTICAL –BZO-C 651

M.M. 70

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. Ovarectomy, hysterectorny, 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