



Bankura University

B.Sc General Degree Course (Programme)

CBCS w.e.f. 2017-18

# **4CBCS SYLLABUS**

**FOR**

**THREE YEARS UNDER-GRADUATE COURSE**

**IN**

**B.Sc General Degree Course (*w.e.f. 2017-18*)**



**BANKURA UNIVERSITY**

**BANKURA**

**WEST BENGAL**

**PIN 722155**



<b>SL. No.</b>	<b>Subject Matter</b>	<b>Page No.</b>
<b>1.</b>	<b>Scheme for CBCS Curriculum</b>	<b>3 - 7</b>
	<b>1.1 Credit Distribution across Courses</b>	<b>3</b>
	<b>1.2 Scheme for CBCS Curriculum in Zoology Degree Programme</b>	<b>4 - 8</b>
	<b>1.3 Choices for Discipline Specific Electives</b>	<b>9</b>
	<b>1.4 Choices of Skill Enhancement Courses</b>	<b>9</b>
<b>2.</b>	<b>Core Courses (Zoology Programme CC 1 to 4)</b>	<b>10 - 14</b>
<b>3.</b>	<b>Discipline Specific Elective Courses (DSE 1 to 2)</b>	<b>15 – 16</b>
<b>4.</b>	<b>Skill Enhancement Courses (SEC 1 to 3)</b>	<b>17-18</b>

**MODEL STRUCTURE IN B.Sc General Degree Course****SEMESTER – I**

Course Code	Course Title	Credit	Marks			No. of Hours		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
UGP/SC/101/C -1A	Invertebrate I	6	10	40	50		25	15
UGP/102/ C- 2A	Discipline-2	6	10	40	50			
UGP/103/ C- 3A	Discipline-3	6	10	40	50			
UG/ 104/ AECC-ENV	Environmental Studies	4	10	40	50			
<b>Total in Semester - I</b>		<b>22</b>	<b>40</b>	<b>160</b>	<b>200</b>			

**SEMESTER –II**

Course Code	Course Title	Credit	Marks			No. of Hours		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
UGP/S.C./201/ C-1B	Ecology	6	10	40	50		25	15
UGP/202/ C-2B	Discipline - 2	6	10	40	50			
UGP/ 203/C- 3B	Discipline - 3	6	10	40	50			
UG/204/ AECC-E/MIL	English/MIL	2	10	40	50			
<b>Total in Semester - II</b>		<b>20</b>	<b>40</b>	<b>160</b>	<b>200</b>			

**SEMESTER – III**

Course Code	Course Title	Credit	Marks			No. of Hours		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
UGP/S.C./301/C-1C	Invertebrate II	6	10	40	50		25	15
UGP/302/C-2C	Discipline - 2	6	10	40	50			
UGP/303/C-3C	Discipline - 3	6	10	40	50			
UGP/S.C./304/SEC-1	Apiculture(Economic Zoology)	2	10	40	50			
<b>Total in Semester - III</b>		<b>20</b>	<b>40</b>	<b>160</b>	<b>200</b>			

**SEMESTER – IV**

Course Code	Course Title	Credit	Marks			No. of Hours		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
UGP/S.C./401/C-1D	Vertebrate	6	10	40	50		25	15
UGP/402/C-2D	Discipline-2	6	10	40	50			
UGP/403/C-3D	Discipline-3	6	10	40	50			
UGP/S.C./404/SEC-2	Aquarium Fish Keeping (Economic Zoology)	2	10	40	50			
<b>Total in Semester - IV</b>		<b>20</b>	<b>40</b>	<b>160</b>	<b>200</b>			

**SEMESTER – V**

Course Code	Course Title	Credit	Marks			No. of Hours		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
UGP/S.C./501/ DSE-1A	DSET 1 Animal Physiology DSEP 1 Animal Physiology Lab	6	10	40	50		25	15
UGP/ 502/DSE- 2A	Discipline - 2	6	10	40	50			
UGP/ 503/DSE- 3A	Discipline - 3	6	10	40	50			
UGP/S.C./504/ SEC-3	Sericulture (Economic Zoology)	2	10	40	50			
<b>Total in Semester – V</b>		<b>20</b>	<b>40</b>	<b>160</b>	<b>200</b>			

**SEMESTER – VI**

Course Code	Course Title	Credit	Marks			No. of Hours		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
UGP/S.C./ 601/DSE-1B	DSET 2 Biochemistry DSEP 2 Biochemistry Lab	6	10	40	50		25	15
UGP/ 602/DSE- 2B	Discipline - 2	6	10	40	50			
UGP/ 603/DSE- 3B	Discipline - 3	6	10	40	50			
UGP/S.C./ 604/SEC-4	Medical Techniques	2	10	40	50			
<b>Total in Semester – VI</b>		<b>20</b>	<b>40</b>	<b>160</b>	<b>200</b>			

UGP= Under Graduate programme/Pass, S.C.= Subject Code C= Core Course, E/H/MIL= English/ Hindi/ Modern Indian Language, H/MIL/E= Hindi/ Modern Indian Language/ English, AECC-E= Ability Enhancement Compulsory Course-English, AECC-ENV= Ability Enhancement Compulsory Course-Environmental Science, SEC= Skill Enhancement Course, GE= Generic Elective, DSE= Discipline Specific Elective IA= Internal Assessment, ESE= End-Semester Examination, Lec.= Lecture, Tu.= Tutorial, and Pr.=Practical



### 3. Core Subjects Syllabus

#### 3.1 Core T1 - Invertebrate I

#### Invertebrate I

4 Credits

##### Unit 1: Animal Classification

1. Definitions: Classification, Systematics and Taxonomy:
  2. Codes of Zoological Nomenclature; Principle of priority; Synonymy and Homonymy.
1. Protozoa
    - a. Classification up to phylum (Levine et. al., 1981) with examples.
    - b. Locomotion in *Euglena*, and *Amoeba*; Conjugation in *Paramecium*.
  - B. Life cycle and pathogenicity of *Plasmodium vivax* and *Entamoeba histolytica*

##### Unit 3: Porifera

- a. Classification up to classes (Hyman) with examples.
- b. Canal system and spicules in sponges

##### Unit 4: Cnidaria

1. Classification up to classes with examples.
2. Metagenesis in *Obelia*.
3. Coral reef diversity, function & conservation

##### Unit 5: Platyhelminthes

1. Classification up to classes with examples.
2. Life cycle and pathogenicity and control measures of *Fasciola hepatica*.

##### Unit 6: Nematoda

1. Classification up to classes with examples.



2. Life cycle, and pathogenicity and control measures of *Wuchereria bancrofti*.

3. Parasitic adaptations in helminthes

### 3.2 Core PI - Invertebrate I Lab

#### Invertebrate I Lab

2 credits

#### List of Practical

1. Study of whole mount of *Euglena*, *Amoeba* and *Paramecium*

2. Identification with reasons of *Amoeba*, *Euglena*, and *Plasmodium vivax* (from the prepared slides).

3. Identification with reasons of *Sycon*, *Obelia*, *Physalia*, *Millepora*, *Aurelia*, *Tubipora*, *Corallium*, *Aicyonium*, *Gorgonia*, *Pennatula*, *Fungia*, *Meandrina*, *Madrepora*

4. Spot Identification and significance of adult *Fasciola hepatica*, *Taenia solium* and *Ascaris lumbricoides*

5. Preparation of Laboratory Note Book

### 3.3 Core T2 - Ecology

#### Ecology

4 Credits

#### Unit 1: Introduction to Ecology

1. Autecology and synecology, Levels of organization,

2. Study of Physical factors, The Biosphere.

#### Unit 2: Population

1. Population: Characteristics, growth forms.

2. Geometric, exponential and logistic growth, equation and patterns, r and K strategies

3. Population regulation - density-dependent and independent factors

#### Unit 3: Community

1. Community characteristics: species diversity, abundance,, dominance, richness,

2. Concept of community stratification, Ecological succession with one example.



**Unit 4: Ecosystem**

1. Types of ecosystem with an example, Food chain: Detritus and grazing food chains, Linear and Y-shaped food chains, Food web, Energy flow through the ecosystem, Ecological pyramids and Ecological efficiencies
2. Nitrogen cycle
3. Human modified forest ecosystem

**Unit 5: Applied Ecology**

1. Wildlife Conservation (in-situ and ex-situ conservation)
2. Management strategies for tiger conservation;

**3.4 Core P2 - Ecology Lab**

**2 Credits**

**Ecology Lab**

**List of Practical**

1. Study of an aquatic ecosystem: Phytoplankton and zooplankton.
2. Measurement of area, temperature, turbidity/penetration of light, determination of pH, and Dissolved Oxygen content (Winkler's method), Chemical Oxygen Demand and free CO<sub>2</sub>
3. Report on a visit to National Park/Biodiversity Park/Wild life sanctuary

**3.5 Core T3 – Invertebrate II**

**Invertebrate II**

**Unit 1: Introduction**

**4 Credits**

Evolution of coelom

**Unit 2: Annelida**

1. Classification up to classes with examples.
2. Excretion through nephridia.

**Unit 3: Arthropoda**

1. Classification up to classes with examples.
2. Respiration in prawn and cockroach.



3. Metamorphosis in Lepidopteran Insects.

5. Compound eye in insects

#### Unit 4: Onychophora

General characteristics and Evolutionary significance

#### Unit 5: Mollusca

1. Classification up to classes with examples.

2. Nervous system in Gastropoda .

3. Feeding and respiration in *Pila* sp

#### Unit 6: Echinodermata

1. Classification up to classes with examples.

2. Water-vascular system in *Asterias* .

3. Larval forms in Echinodermata

#### Unit 7: Hemichordata

1. General characteristics of phylum Hemichordata.

2. Relationship with non-chordates and chordates

#### 3.6 Core P3 - Invertebrate II Lab

**Invertebrate II Lab**

**2 Credits**

#### List of Practical

1. Identification with reasons:

Annelids - *Aphrodite*, *Nereis*, *Sabella*, *Chaetopterus*, *Pheretima*, *Hirudinaria*

Arthropods - *Carcinoscorpius*, *Paiaemon*, *Daphnia*, *Balanus*, *Sacculina*, *Eupagurus*, *Scolopendra*, *Bombyx*, *Periplaneta*, *Apis*

Onychophora - *Peripatus*

Molluscs - *Chiton*, *Pila*, *Doris*, *Unio*, *Pinctada*, *Sepia*, *Octopus*,

Echinodermates - *Asterias*, *Ophiura*, *Echinus*, and *Antedon*.



2. Study of digestive system, of earthworm
3. Study of T.S. through typhlosolar intestine of earthworm
4. Mount of mouth parts and dissection of digestive system of *Periplaneta*\*.
5. Submission of Laboratory Note book.

### 3.7 Core T4 - Vertebrates

#### Vertebrates

4 Credits

#### Unit 1: Introduction to Chordates

Concept of Phylum Chordata

#### Unit 2: Protochordata

1. Classification of sub-phylum Urochordata and Cephalochordata up to Classes with examples.
2. Anatomical Peculiarities of *Branchiostoma*.

#### Unit 3: Agnatha

General characteristics and classification of cyclostomes with examples.

#### Unit 4: Pisces

1. Classification of Chondrichthyes and Osteichthyes up to Subclasses with examples.
2. Accessory respiratory organ, and migration in fishes .
3. Swim bladder in fishes.

#### Unit 4: Amphibia

1. Classification up to living Orders with examples.
2. Metamorphosis in Amphibia .

#### Unit 6: Reptilia

1. Classification up to living Orders with examples.
2. Poison apparatus and Biting mechanism in Snake



**Unit 7: Aves**

1. Classification up to Sub-Classes with examples.
2. Migration in Birds.
3. Principles and aerodynamics of flight

**Unit 9: Mammals**

1. Classification up to living orders with examples.
2. Anatomical Peculiarities of Monotremata
3. Exoskeleton derivatives of mammals
4. Echolocation in Micro chiropterans and Cetaceans

**Unit 10: Zoogeography**

Zoogeographical realms, Plate tectonic and Continental drift theory.

**3.8 Core P4 – Vertebrates Lab**

**Vertebrates Lab**

**2 Credits**

**List of Practical**

1. Protochordata: Balanoglossus, Branchiostoma
2. Agnatha : Petromyzon, Myxine
3. Fishes: Scoliodon, Sphyrna, Pristis, Heteropneustes, Labeo, Exocoetus, Echeneis, Anguilla, Hippocampus, Tetradon/ Diodon, Anabas, Flat fish
4. Amphibia: Necturus, Bufo, Hyla, Alytes, Tylotriton
5. Reptilia: Chelone, Trionyx, Hemidactylus, Varanus, Uromastix, Chamaeleon, Ophiosaurus, Draco, Bungarus, Vipera, Naja, Hydrophis,
6. Mammalia: Bat (Insectivorous and Frugivorous), Funambulus
8. Dissection of brain and pituitary of Tilapia carp .



#### 4. DSE

##### 4. DSE T1 - Animal Physiology

##### Animal Physiology

4 Credits

###### Unit 1: Tissues

Classification, structure and functions of epithelial tissue, connective tissue, and muscular tissue.

###### Unit 2: Bone

Structure and types of bones

###### Unit 3: Nervous System

Structure of neuron, resting membrane potential, Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers; Types of synapse. Synaptic transmission and Neuromuscular junction

###### Unit 4: Muscular system

Histology of different types of muscle; Ultra structure of skeletal muscle; Characteristics of muscle fibre

###### Unit 5: Reproductive System

Histology of testis and ovary Physiology of Reproduction

###### Unit 6: Endocrine System

1. Histology and function of pituitary, thyroid, pancreas and adrenal

2. Classification of hormones; Mechanism of Hormone action

3. Placental hormones

##### 4.2 DSE P1 - Animal Physiology Lab

##### Animal Physiology Lab

2 Credits

###### List of Practical

1. Recording of computer aided simple muscle twitch with electrical stimulation (or Virtual)

2. Preparation of temporary mounts: Squamous epithelium, Striated muscle fibres and nerve cells

3. Study of permanent slides of Mammalian skin, Pituitary, Pancreas, Testis, Ovary, Adrenal, Thyroid and Parathyroid



#### 4.3 DSE T2- Biochemistry

##### Biochemistry

4 Credits

##### Unit 1: Carbohydrates

1. Structure and Biological importance: Monosaccharides, Disaccharides, Polysaccharides.
2. Carbohydrate metabolism: Glycolysis, Citric acid cycle, Pentose phosphate pathway, Gluconeogenesis

##### Unit 2: Lipids

1. Structure and Significance: Physiologically important saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Sphingolipid, Glycolipids, Steroids, Eicosanoids and terpenoids.

##### Unit 3: Proteins

1. Amino acids: Structure, Classification, General and Electro chemical properties of  $\alpha$ -amino acids; Physiological importance of essential and non-essential amino acids
2. Protein metabolism: Transamination, Deamination, Urea cycle, Fate of C-skeleton of Glucogenic and Ketogenic amino acids

##### Unit 4: Nucleic Acids

1. Structure: Purines and pyrimidines, Nucleosides, Nucleotides, Nucleic acids
2. Types of DNA and RNA

##### Unit 5: Enzymes

Nomenclature and classification; Cofactors; Specificity of enzyme action; Isozymes; Mechanism of enzyme action; Enzyme kinetics; Michaelis-Menten equation,

#### 4.4 DSE P2- Biochemistry Lab

##### Biochemistry Lab

2 Credits

##### List of Practical

1. Qualitative tests of functional groups in carbohydrates, proteins and lipids.
2. To study the enzymatic activity of Trypsin and Lipase.



**5. Skill Enhancement Course**

**5.1 SEC T1 – Apiculture (Economic Zoology)**

**Apiculture (Economic Zoology)**

**2 Credits**

**Unit 1: Biology of Bees**

1. Classification and Biology of Honey Bees
2. Social Organization of Bee Colony

**Unit 2: Rearing of Bees**

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

**Unit 3: Diseases and Enemies**

1. Bee Diseases and Enemies
2. 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**

**5.2 SEC T2 Aquarium Fish Keeping (Economic Zoology)**

**Aquarium Fish Keeping (Economic Zoology)**

**2 Credits**

**Unit 1: Introduction to Aquarium Fish Keeping**

Exotic and Endemic species of Aquarium Fishes



**Unit 2: Biology of Aquarium Fishes**

Common characters and sexual dimorphism of Fresh water and Marine Aquarium fishes such as Guppy, Molly, Sword tail, Gold fish, Angel fish, Blue morph, Anemone fish and Butterfly fish

**Unit 3: Food and feeding of Aquarium fishes**

Use of live fish feed organisms. Preparation and composition of formulated fish feeds, Aquarium fish as larval predator

**Unit 4: Fish Transportation**

Live fish transport - Fish handling, packing and forwarding techniques.

**Unit 5: Maintenance of Aquarium**

General Aquarium maintenance - budget for setting up an Aquarium Fish Farm as a Cottage Industry

**5.3 SEC T3 Sericulture (Economic Zoology)**

**Sericulture (Economic Zoology)**

**2 Credits**

**Unit 1: Introduction**

1. Types of silkworms, Distribution and Races
2. Exotic and indigenous races
3. Mulberry and non-mulberry Sericulture

**Unit 2: Biology of Silkworm**

1. Life cycle of Bombyx mori
2. Structure of silk gland and secretion of silk

**Unit 3: Rearing of Silkworms**

1. Selection of mulberry variety and establishment of mulberry garden
2. Rearing house and rearing appliances..
3. Disinfectants: Formalin, bleaching powder, RKO
4. Silkworm rearing technology: Early age and Late age rearing



5. Types of mountages

6. Spinning, harvesting and storage of cocoons

**Unit 4: Pests and Diseases**

1. Pests of silkworm

2. Diseases: Protozoan, viral, fungal and bacterial

3. Control and prevention of pests and diseases

**Unit 5: Entrepreneurship in Sericulture**

Prospectus of Sericulture in India: Sericulture industry in different states, employment, potential in mulberry and non-mulberry sericulture

Visit to sericulture centres.

**5.4 SEC T4 Medical Techniques**

**Medical Techniques**

**2 Credits**

**Unit 1:** Introduction to Medical Diagnostics and its Importance

**Unit 2:** Diagnostics Methods Used for Analysis of Blood

Blood composition, Preparation of blood smear and Differential Leucocyte Count (D.L.C) using Leishman's stain, Platelet count using haemocytometer, Erythrocyte Sedimentary Rate (E.S.R), Packed Cell Volume (P.C.V.)

**Unit 3:** Diagnostic Methods Used for Urine Analysis Urine Analysis: Physical characteristics: Abnormal constituents

**Unit 4:** Non-infectious Diseases diagnosis and prevention of Diabetes (Type I and Type II), Hypertension (Primary and secondary), Testing of blood glucose using Glucometer/Kit

**Unit 5:** Infectious Diseases

Causes, types, symptoms, diagnosis and prevention of Tuberculosis and Hepatitis, Malarial parasite (Microscope based and ELISA based)

**Unit 6:** Clinical Biochemistry

LFT, Lipid profiling

**Unit 7:** Tumours

Types (Benign/Malignant), Detection and metastasis: Medical imaging: X-Ray of Bone fracture, PET, MRI and CT Scan (using photographs).

