

**SCHEME AND SYLLABUS UNDER
CHOICE BASED CREDIT SYSTEM
B.Sc. WITH ZOOLOGY (REGULAR COURSE)**

	CORE COURSE (12)	Ability Enhancement Compulsory Courses AEC (2)	Skill Enhancement Courses SEC (4)	Discipline Specific Elective DSE (6)
I	DSC-1A: Animal Diversity DSC-2A: Botany DSC-3A: Chemistry	English/Hind/MIL Communication		
II	DSC-1B: Comparative Anatomy and Developmental Biology of Vertebrates DSC-2B: Botany DSC-3B: Chemistry	Environmental Science		
III	DSC-1C: Physiology and Biochemistry DSC-2C: Botany DSC-3C- Chemistry		SEC-1 : Sericulture	
IV	DSC-1D: Genetics and Evolutionary Biology DSC-2D: Botany DSC-3D: Chemistry		SEC- 2: Aquarium Fish Keeping	
V			SEC- 3: Medical Diagnostics	DSE-1A: Immunology DSE-2A: Botany DSE-3A: Chemistry
VI			SEC-4: Apiculture	DSE-1B: Animal Biotechnology DSE-Botany II DSE-Chemistry II

Discipline Core Courses: Zoology

DSC-1A: Animal Diversity

DSC-1B: Comparative Anatomy and Developmental Biology of Vertebrates

DSC-1C: Physiology and Biochemistry

DSC-1D: Genetics and Evolutionary Biology

Discipline Specific Electives: Zoology (Any two)

DSE-1A: Immunology

DSE-1B: Animal Biotechnology

Skill Enhancement Courses (SCE)

SCE- 1 : Sericulture

SCE- 2 : Aquarium Fish Keeping

SCE- 3 : Public Health and Hygiene

SCE- 4 : Apiculture

Note: The students of B.Sc. Zoology pass course adopting Chemistry in their course should take Chemistry syllabus from Life Sciences.

Bodoland University
Department of Zoology
Curriculum Structures for UG syllabus for B.Sc. (Regular Course)
No. of papers =12+12=24, Total Credits= 120
Total Marks=2100

SEM-I						
Paper Code	Course	Credit	Credit Distribution (L+T+P)	End Sem Marks	Internal Marks	Total Marks
ZOO-101R	DSC-1A: Animal Diversity	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-102R	DSC-2A	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-103R	DSC-3A	6	4+0+2	60(Theo)+20(Pract)	20	100
COMM-104HR	AEC: AECC-1: English/Hind/MIL (Communication)	2	2+0+0	50	-	50
Total		20	20	290	60	350

SEM-II						
Paper Code	Course	Credit	Credit Distribution (L+T+P)	End Sem Marks	Internal Marks	Total Marks
ZOO-201R	DSC-1B: Comparative Anatomy and Developmental Biology of Vertebrates	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-202R	DSC-2B	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-203R	DSC-3B	6	4+0+2	60(Theo)+20(Pract)	20	100
COMM-204HR	AEC: AECC-2: Environmental Science	2	2+0+0	50	-	50
Total		20	20	290	60	350

SEM-III						
Paper Code	Course	Credit	Credit Distribution (L+T+P)	End Sem Marks	Internal Marks	Total Marks
ZOO-301R	DSC-1C: Physiology and Biochemistry	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-302R	DSC-2C	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-303R	DSC-3C	6	4+0+2	60(Theo)+20(Pract)	20	100
ZOO-304HR	AEC: SEC-1: Sericulture	2	2+0+0	50	-	50
Total		20	20	290	60	350

SEM-IV						
Paper Code	Course	Credit	Credit Distribution (L+T+P)	End Sem Marks	Internal Marks	Total Marks
ZOO-401R	DSC-1D: Genetics and Evolutionary Biology	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-402R	DSC-2D	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-403R	DSC-3D	6	4+0+2	60(Theo)+20(Pract)	20	100
ZOO-404HR	AEC: SEC-2: Aquarium Fish Keeping	2	2+0+0	50	-	50
Total		20	20	290	60	350

SEM-V						
Paper Code	Course	Credit	Credit Distribution (L+T+P)	End Sem Marks	Internal Marks	Total Marks
ZOO-D1HR	DSE-1A: Immunology	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-502R	DSE-2A	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-503R	DSE-3A	6	4+0+2	60(Theo)+20(Pract)	20	100
ZOO-504R	AEC: SEC-3: Medical Diagnostics	2	2+0+0	50	-	50
Total		20	20	290	60	350

SEM-VI						
Paper Code	Course	Credit	Credit Distribution (L+T+P)	End Sem Marks	Internal Marks	Total Marks
ZOO-D2HR	DSE-1B: Animal Biotechnology	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-602H	DSE-2B	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-603R	DSE-3B	6	4+0+2	60(Theo)+20(Pract)	20	100
ZOO-604R	AEC: SEC-4: Apiculture	2	2+0+0	50	-	50
Total		20	20	290	60	350

1ST SEMESTER SYLLABUS (REGULAR)

SEM-I						
Paper Code	Course	Credit	Credit Distribution (L+T+P)	End Sem Marks	Internal Marks	Total Marks
ZOO-101R	DSC-1A: Animal Diversity	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-102R	DSC-2A	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-103R	DSC-3A	6	4+0+2	60(Theo)+20(Pract)	20	100
COMM-104HR	AEC: AECC-1: English/Hind/MIL (Communication)	2	2+0+0	50	-	50
Total		20	20	290	60	350

DSC-1A: ANIMAL DIVERSITY

THEORY

(CREDITS 4)

Unit 1: Kingdom Protista	4 Lectures
General characters and classification up to classes; Locomotory Organelles and locomotion in Protozoa	
Unit 2: Phylum Porifera	3
General characters and classification up to classes; Canal System in <i>Sycon</i>	
Unit 3: Phylum Cnidaria	3
General characters and classification up to classes; Polymorphism in Hydrozoa	
Unit 4: Phylum Platyhelminthes	3
General characters and classification up to classes; Life history of <i>Taenia solium</i>	
Unit 5: Phylum Nematelminthes	5
General characters and classification up to classes; Life history of <i>Ascaris lumbricoides</i>	
Unit 6: Phylum Annelida	3
General characters and classification up to classes	
Unit 7: Phylum Arthropoda	5
General characters and classification up to classes Metamorphosis in Insects	
Unit 8: Phylum Mollusca	4
General characters and classification up to classes	
Unit 9: Phylum Echinodermata	4
General characters and classification up to classes; Water-vascular system in Asteroidea	
Unit 10: Protochordates	2
General features of Protochordata	
Unit 11: Agnatha	2
General features of Agnatha and classification of cyclostomes up to classes	
Unit 12: Pisces	4
General features and Classification up to orders; Osmoregulation in Fishes	
Unit 13: Amphibia	4
General features and Classification up to orders; Parental care	
Unit 14: Reptiles	4
General features and Classification up to orders; Poisonous and non-poisonous snake	
Unit 15: Aves	5
General features and Classification up to orders; Flight adaptations in birds	
Unit 17: Mammals	5
Classification up to orders	
Note: Classification of Unit 1-9 to be followed from “Barnes, R.D. (1982). <i>Invertebrate Zoology</i> , V Edition”	

PRACTICAL

(CREDITS 2)

1. Study of the following specimens:
2. *Amoeba*, *Paramecium*, *Obelia*, *Tubipora*, *Metridium*, *Taenia solium*, Male and female *Ascaris lumbricoides*, *Pheretima*, *Hirudinaria*, *Cancer*, *Limulus*, *Julus*, *Apis*, *Dentalium*, *Pila*, *Unio*, *Pentaceros*, *Echinus*, *Cucumaria*, *Balanoglossus*, *Petromyzon*, *Torpedo*,

Labeo, *Ichthyophis/Ureotyphlus*, *Salamandra*, *Chelone*, *Hemidactylus*, Any six common birds from different orders, Bat, *Funambulus*

3. Study of the following permanent slides:
4. Study of life history stages of *Taenia*, T.S. of Male and female *Ascaris*

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.

SUGGESTED READINGS

- Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
- 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
- Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
- Pough H. *Vertebrate life*, VIII Edition, Pearson International.
- Hall B.K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.

3RD SEMESTER SYLLABUS (REGULAR)

SEM-III						
Paper Code	Course	Credit	Credit Distribution (L+T+P)	End Sem Marks	Internal Marks	Total Marks
ZOO-301R	DSC-1C: Physiology and Biochemistry	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-302R	DSC-2C	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-303R	DSC-3C	6	4+0+2	60(Theo)+20(Pract)	20	100
ZOO-304HR	AEC: SEC-1: Sericulture	2	2+0+0	50	-	50
Total		20	20	290	60	350

DSC-1C: PHYSIOLOGY AND BIOCHEMISTRY

THEORY **(CREDITS 4)**

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 fibres

Unit 2: Digestion **5**

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

Unit 3: Respiration **5**

Transport of Oxygen and carbon dioxide in blood

Unit 4: Excretion **5**

Structure of nephron, Mechanism of Urine formation

Unit 5: Cardiovascular system **6**

Composition of blood, Hemostasis, Structure of Heart, Origin and conduction of the Cardiac impulse

Unit 6: Reproduction and Endocrine Glands **7**

Physiology of male reproduction: hormonal control of spermatogenesis; Physiology of female reproduction: hormonal control of menstrual cycle; Structure and function of pituitary, thyroid, pancreas

Unit 7: Carbohydrate Metabolism **8**

Glycolysis, Krebs Cycle, Gluconeogenesis, Glycogen metabolism

Unit 8: Lipid Metabolism **5**

Biosynthesis and β oxidation of palmitic acid

Unit 9: Protein metabolism **5**

Transamination, Deamination

Unit 10: Enzymes **6**

Introduction, Mechanism of action

PRACTICAL **(CREDITS 2)**

1. Preparation of hemin and hemochromogen crystals
2. Study of permanent histological sections of mammalian pituitary, thyroid, pancreas
3. Study of permanent slides of duodenum, liver, lung, kidney
4. Qualitative tests to identify functional groups of carbohydrates in given solutions (Glucose)
5. Estimation of total protein in given solutions by Lowry's method.
6. Study of activity of salivary amylase under optimum conditions

SUGGESTED READINGS

- Tortora, G.J. and Derrickson, B.H. (2009). *Principles of Anatomy and Physiology*, XII Edition, John Wiley & Sons, Inc.
- Widmaier, E.P., Raff, H. and Strang, K.T. (2008) *Vander's Human Physiology*, XI Edition., McGraw Hill
- Guyton, A.C. and Hall, J.E. (2011). *Textbook of Medical Physiology*, XII Edition, Harcourt Asia Pvt. Ltd/ W.B. Saunders Company
- Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). *Biochemistry*. VI Edition. W.H Freeman and Co.

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

SEC-1: SERICULTURE

THEORY **(CREDITS 2)**

Unit 1: Introduction **(3 Lectures)**

Sericulture: Definition, history and present status

Types of silkworms, Distribution and Races

Mulberry and non-mulberry Sericulture

Unit 2: Biology of Silkworm **(3)**

Life cycle of *Bombyx mori*

Unit 3: Rearing of Silkworms **(13)**

Selection of mulberry variety and establishment of mulberry garden

Rearing house and rearing appliances

Disinfectants: Formalin, bleaching powder, RKO

Spinning, harvesting and storage of cocoons

Unit 4: Pests and Diseases **(4)**

Pests of silkworm: vertebrates

Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial

Control and prevention of pests and diseases

Unit 5: Entrepreneurship in Sericulture **(2)**

Prospectus of Sericulture in India: employment potential in mulberry and non-mulberry sericulture

SUGGESTED READINGS

- Handbook of Practical Sericulture: S.R. Ullal and M.N. Narasimhanna CSB, Bangalore
- Appropriate Sericultural Techniques; Ed. M. S. Jolly, Director, CSR & TI, Mysore.
- Handbook of Silkworm Rearing: Agriculture and Technical Manual-1, Fuzi Pub. Co. Ltd., Tokyo, Japan 1972.
- Manual of Silkworm Egg Production; M. N. Narasimhanna, CSB, Bangalore 1988.
- Silkworm Rearing; Wupang—Chun and Chen Da-Chung, Pub. By FAO, Rome 1988.
- A Guide for Bivoltine Sericulture; K. Sengupta, Director, CSR & TI, Mysore 1989.
- Improved Method of Rearing Young age silkworm; S. Krishnaswamy, reprinted CSB, Bangalore, 1986.

5TH SEMESTER SYLLABUS (REGULAR)

SEM-V						
Paper Code	Course	Credit	Credit Distribution (L+T+P)	End Sem Marks	Internal Marks	Total Marks
ZOO-D1HR	DSE-1A: Immunology	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-502R	DSE-2A	6	4+0+2	60(Theo)+20(Pract)	20	100
Paper-503R	DSE-3A	6	4+0+2	60(Theo)+20(Pract)	20	100
ZOO-504R	AEC: SEC-3: MEDICAL DIAGNOSTICS	2	2+0+0	50	-	50
Total		20	20	290	60	350

DSE 1A: IMMUNOLOGY

THEORY **(CREDITS 4)**

Unit 1: Overview of the Immune System **10 Lectures**

Introduction to basic concepts in immunology, components of immune system, principles of innate and adaptive immune system

Unit 2: Cells and Organs of the Immune System **8**

Haematopoiesis, Cells of immune system and organs (primary)

Unit 3: Antigens **8**

Basic properties of antigens, B and T cell epitopes, haptens and adjuvants

Unit 4: Antibodies **8**

Structure, classes and function of antibodies, monoclonal antibodies, antigen

Unit 5: Working of the immune system **12**

Structure and functions of MHC, exogenous and endogenous pathways of Antigen presentation and processing, Complement system

Unit 6: Immune system in health and disease **10**

brief description of various types of hypersensitivities, Introduction to concepts of autoimmunity and immunodeficiency,

Unit 7: Vaccines **4**

General introduction to vaccines, Various types of vaccines

PRACTICAL **(CREDITS 2)**

1. Histological study of spleen, thymus and lymph nodes through slides/ photographs
2. Preparation of stained blood film to study various types of blood cells.
3. Ouchterlony's double immuno-diffusion method.
4. Demonstration of
 - a. ELISA
 - b. Immunoelectrophoresis

(*Subject to UGC guidelines)

SUGGESTED READINGS

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

SEC-3: MEDICAL DIAGNOSTICS

THEORY	(CREDITS 2)
Unit 1: Introduction to Medical Diagnostics and its Importance	2 Lectures
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,	10
Unit 3: Diagnostic Methods Used for Urine Analysis Urine Analysis: Physical characteristics	6
Unit 4: Non-infectious Diseases Causes, types, symptoms, complications, diagnosis and prevention of Diabetes (Type I and Type II), Hypertension (Primary and secondary)	6
Unit 5: Infectious Diseases Causes, types, symptoms, diagnosis and prevention of Tuberculosis	3
Unit 6: Tumours Types (Benign/Malignant), Detection and metastasis; Medical imaging: X-Ray of Bone fracture	3

SUGGESTED READINGS

- Park, K. (2007), Preventive and Social Medicine, B.B. Publishers
- Godkar P.B. and Godkar D.P. Textbook of Medical Laboratory Technology, II Edition, Bhalani Publishing House
- Cheesbrough M., A Laboratory Manual for Rural Tropical Hospitals, A Basis for Training Courses
- Guyton A.C. and Hall J.E. Textbook of Medical Physiology, Saunders
- Robbins and Cortan, Pathologic Basis of Disease, VIII Edition, Saunders
- Prakash, G. (2012), Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.
