

Syllabus For
Bachelor of Science in Zoology (Generic Elective)
Under Choice Based Credit System

Academic Session

w.e.f. 2020-2023



For

All Constituents / Affiliated Colleges Under
BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY,
DHANBAD, JHARKHAND

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**Proposed Scheme For Choice Based Credit System In
B.Sc. Generic Elective Program**

Semester I

Course	Course Code	Name of Papers	Full Marks	End Semester (Ext. Marks)	Mid Semester (Int. marks)
Generic Elective	ZOO-H-GE-101-T (04 Credits 60 Lectures)	Animal Classification & Diversity	75	60	15
	ZOO-H-GE-101-P (02 Credits 30 Lectures)	Practical	25	20	05

Semester II

Course	Course Code	Name of Papers	Full Marks	End Semester (Ext. Marks)	Mid Semester (Int. marks)
Generic Elective	ZOO-H-GE-202-T (04 Credits 60 Lectures)	Cell Biology, Genetics & Evolution	75	60	15
	ZOO-H-GE-202-P (02 Credits 30 Lectures)	Practical	25	20	05

Semester III

Course	Course Code	Name of Papers	Full Marks	End Semester (Ext. Marks)	Mid Semester (Int. marks)
Generic Elective	ZOO-H-GE-303-T (04 Credits 60 Lectures)	Biochemistry, physiology & Developmental Biology	75	60	15
	ZOO-H-GE-303-P (02 Credits 30 Lectures)	Practical	25	20	05

Semester IV

Course	Course Code	Name of Papers	Full Marks	End Semester (Ext. Marks)	Mid Semester (Int. marks)
Generic Elective	ZOO-H-GE-404-T (04 Credits 60 Lectures)	Ecology & Economic Zoology	75	60	15
	ZOO-H-GE-404-P (02 Credits 30 Lectures)	Practical	25	20	05

**Members of Board of Studies of CBCS under Graduate Syllabus as Per
Guidelines of Binod Bihari Mahto Koyalanchal University, Dhanbad**

Sl. No.	Name	Signature
1.	Dr. Shailendra Kumar Sinha – Chairman Associate Professor Head University Dept. of Zoology BBMKU, Dhanbad	
2.	Dr. Birendra Kumar, -Invited Member Associate Professor Dean Faculty of Science, BBMKU, Dhanbad	
3.	Dr. Lal Bihari Singh - Member DSW, BBMKU, Dhanbad.	
4.	Dr. K. K. Gupta - Expert Member Associate Professor University Dept. of Zoology, VBU, Hazaribag.	
5.	Dr. Ajay Kumar Choudhary, - Expert Member Associate Professor, University Dept. of Zoology, DSPMU, Ranchi.	
6.	Dr. Navita Gupta - Member Associate Professor, University Dept. of Zoology, BBMKU, Dhanbad.	
7.	Dr. Rupam Mallik, - Member Assistant Professor, University Dept. of Zoology, BBMKU, Dhanbad.	
8.	Dr, Sarita Murmu, - Member Assistant Professor, University Dept. of Zoology, BBMKU, Dhanbad.	

9. Dr. B. N. Mahto, - Member
Assistant Professor
Dept. of Zoology, Chas College, Chas.
10. Sri S. C. Dan, - Member
Assistant Professor,
Department of Zoology,
R. S. More College, Govindpur.

B.Sc. Zoology –Generic Elective

B.Sc. Semester I

ZOO-H-GE-101-T

- In all nine questions are to set of equal values and five questions are to be answered of which question no 1 will be compulsory
 - Questions will be grouped into two-Group A and Group-B.
 - Group A will comprise questions no.1 which will consist of two parts A & B. Part A will be MCQs type, covering entire syllabus and carry one mark each ($1 \times 6 = 6$) and part B will comprise short answer, three mark each ($3 \times 2 = 6$).
 - Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from the group.
 - The question no. 9 will be of short notes type each carrying six marks ($6 \times 2 = 12$) in which only two should be answered out of four options.
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ANIMAL CLASSIFICATION & DIVERSITY

Credit-04

Lectures-60

F.M: 75 (60 Ext. + 15 Int.)

Non- Chordates

UNIT-1 General character and classification (up to classes) of the following phyla:

1.1 Protozoa, Porifera, Coelenterata, Platyhelminthes, Annelida, Mollusca, Arthropoda, Echinodermata & Hemichordata with Examples

UNIT-2 Non Chordates Form & Function

2.1 Protozoa: Pathogenicity, treatment & prevention of diseases caused by

2.1.1: *Entamoebahistolytica*

2.1.2: *Leishmaniadonovani*

2.2 Protozoa: Structure and Reproduction of *Paramecium*.

2.3 Porifera: Canal system of *Sycon*

2.4 Coelenterata: Life cycle of *Obelia* & Metagenesis

2.5 Platyhelminthes: *Taeniasolium* –life cycle & their pathogenicity

2.6 Aschelminthes: *Ascaris*- life cycle & their pathogenicity

2.7 Annelida: *Pheretima*- Excretory system

2.8 Arthropoda: *Palaemon*- Respiratory system, Metamorphosis in insects

2.9 Mollusca: *Pila*-Respiratory system

2.10 Echinodermata: *Asterias* – Water vascular System

Chordates

**UNIT-3 General character and classification of living chordates of the following
Classes: Amphibia, Reptilia& Mammalia**

UNIT-4 Study of following types

- 4.1 Pisces: Respiratory & Accessory Respiratory organs
- 4.2 Reptilia: Biting mechanism of snake, Poison gland , Venom
- 4.3 Aves: Flight Adaptation in Birds
- 4.4 Mammals: Characters, distribution and affinities of Prototheria

Books Recommended

Non- Chordates

1. Ruppert and Barnes ,RD(2006) Invertebrate Zoology, VIII edition .Holt Saunders International edition
1. Campbell & Reece: Biology (7th edn. 2005, Pearson)
2. Nigam: Biology of Non-chordates (1997, S Chand)
3. Miller and Harley : zoology (6th Ed. 2005,W.C.Brown)

Chordates

1. Miller & Harley: Zoology (6thed. 2005, W.C. Brown)
2. Nigam: Biology of Chordates (1997, S Chand)
3. Parker &Haswell, A Text Book of Zoology Vol.II (2005, Macmillan)
4. Sinha, A.K., & Adhikari,S and Ganguli, B.B Biology of Animals Vol.II New Central Agency, Calcutta

B.Sc. Zoology –Generic Elective

B.Sc. Semester I

ZOO-H-GE-101-P

CLASSIFICATION & ANIMAL DIVERSITY

Credit – 2

Lectures - 30

F.M:25 (20 Ext. + 05 Int.)

F.M -Time: 1 and half Hr

Practical

FM:20

1. Dissection/Project:	05
2. Mounting of given specimens	02
3. Spotting	
a. Slides	2×2=04
b. Specimens	2×2=04
4. Practical Record & Viva	05

Total=20

List of suggested Practicals

- 1. Dissection:**
 - Palaemon*-Nervous and Digestive system
 - Local bony fishes: Afferent and Efferent branchial vessel.
- 2. Mounting:** Spicules of Porifera, Obelia colony, Daphnia, trachea and salivary gland of cockroach, septal nephridia and sperm theca of Earthworm
- 3. Museum Specimens:** *Sycon*, *Euspongia*, *Aurelia*, *Gorgonia*, *Porpitta*, *Vallela*, *Metridium*, *Fungia*, *Tubipora*, *Pennatula*, *Meandrina*, *Tapeworm*, *Fasciola*, *Ascaris*, *Pheretima*, *Hirudinaria*, *Neries*, *Pila*, *Unio*, *Loligo*, *Sepia*, *Octopus*, Hermit Crab, Prawn, *Asterias*, Sea Urchin, Brittle star
- 4. Permanent slides:** *Paramecium* Slide (WM), *Paramecium* Conjugation, L.S of *Sycon*, *Obelia* Colony, Medusa, *Fasciola* (W.M), Proglottids of Tapeworm, T.S of *Pheretima* through different regions, T.S of male & female *Ascaris*,
- 5. Museum Specimens (Chordates):** *Torpedo*, *Scoliodon*, *Labeo*, *Exocoetus*, *Echeneis*, *Hippocampus*, *Bufo*, *Hyla*, *Salamandra*, *Draco*, *Naja*, *Chamaeleon*, Bat (Insectivorous and Frugivorous)
- 6. Project:** To submit a Project Report on any related topic.

B.Sc. Zoology –Generic Elective

B.Sc. Semester II

ZOO-H-GE-202-T

- In all nine questions are to set of equal values and five questions are to be answered of which question no 1 will be compulsory
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 - Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from the group.
 - The question no. 9 will be of short notes type each carrying six marks ($6 \times 2 = 12$) in which only two should be answered out of four options.
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CELL BIOLOGY, GENETICS & EVOLUTION

Credit-04

Lectures-60

F.M: 75 (60 Ext. + 15 Int.)

Cell Biology

UNIT-1 Cell Structure & Functions

- 1.1 Study of structure & functions of Plasma membrane
- 1.2 Study of Cell Organelle- Mitochondria, E.R, Ribosome, Lysosome
- 1.3 Types and structure of a typical chromosome-
 - a) Ultrastructure of chromatin fiber-Nucleosome, Polytene and Lampbrush chromosome
- 1.4 Cell Division: Mitosis, Meiosis their significance.

Genetics

UNIT-2 Principle of Genetics

- 2.1 Mendel's Law of Inheritance
- 2.2 Linkage & Crossing Over
- 2.3 DNA: Structure &Function

UNIT-3 Concept of gene expression

- 3.1 Semi conservative DNA Replication in Prokaryotes
- 3.2 Transcription in Prokaryotes
- 3.3 Translation in Prokaryotes

Evolution

UNIT-4 Evolution

- 4.1 Theory of organic evolution; Lamarckism's theory of inheritance of acquired characters
 Criticism and Neo-Lamarckism
- 4.2 Darwin's theory of natural selection, Criticism and Neo-Darwinism

Books Recommended

Cell Biology

- 1. Alberts *et al*: Essential Cell Biology (1998, Garland)
- 2. Karp: Cell and Molecular Biology (2008, John Wiley)
- 3. Lodish *et al*: Molecular Cell Biology (2008, Freeman) 2004

Genetics

- 1. Brooker: Genetics : Analysis and Principles (1999, Addison-Wesley,)
- 2. Gardner *et al*: Principles of Genetics (1991, John Wiley)
- 3. Russell: Genetics (2002, Benjamin Cummings)

Evolution

- 1. Moody: Introduction to Evolution (1978, Kalyani).
- 2. Savage: Evolution (1963, Holt, Reinhart and Winston)
- 3. Rastogi: Organic Evolution (1988, Kedarnath & Ramnath)
- 4. Strickberger: Evolution (2004, Jones & Bartlett)

B.Sc. Zoology –Generic Elective

B.Sc. Semester II

ZOO-H-GE-202-P

CELL BIOLOGY, GENETICS & EVOLUTION

Credit – 2

Lectures - 30

F.M:25 (20 Ext. + 05 Int.)

F.M - Time: 1 and half Hr

Practical	FM:20	
1. Pedigree Analysis (one)		05
2. Slide Preparation		04
3. Spotting		
a. Slides		01×2=02
b. Analogous/Homologous organs/ Fossils/Extinct Models		2×2=04
c. Practical Record & Viva		05

Total=20

List of Suggested Practical's

1. Study of permanent slides of cell division (Mitosis/Meiosis)
2. Preparation of mitotic slides from onion root tips.
3. Study of Polytene and lampbrush chromosome through photographs
4. Study of sex linked characters: Hemophilia and colorblindness through Pedigree Analysis
5. Study of homologous and analogous organs
6. Study of some fossils/extinct models: Trilobites, Archaeopteryx

B.Sc. Zoology –Generic Elective

B.Sc. Semester III

ZOO-H-GE-303-T

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BIOCHEMISTRY, PHYSIOLOGY & DEVELOPMENTAL BIOLOGY

Credit-04

Lectures-60

F.M: 75 (60 Ext. + 15 Int.)

Biochemistry

UNIT-1 **Structure and classification of biomolecules**

- 1.1 Protein: Types, Structure, biological Significance
- 1.2 Carbohydrates: Structure, Classification, biological Significance
- 1.3 Lipids: Structure, Classification, biological Significance

UNIT-2 **Metabolism**

- 2.1 Glycolysis
- 2.2 Kreb's cycle

Physiology

UNIT-1 **Blood composition, Blood Coagulation**

UNIT-2 **Respiration:**

- 2.1 Transport of Oxygen (O_2)
- 2.2 Transport of Carbon Dioxide (CO_2)

UNIT-3 Digestion of food:

- 3.1 Protein
- 3.2 Carbohydrate
- 3.3 Lipid

UNIT-4 Excretion: Nephron & Urine formation

UNIT-5 Histo-Physiology of Following Endocrine Glands

- 5.1 Thyroid Gland
- 5.2 Adrenal gland
- 5.3 Pancreas

UNIT-6 Histo-Physiology of:

- 6.1 Testis
- 6.2 Ovary

Development Biology

UNIT-1 Gametogenesis

- 1.1 Spermatogenesis
- 1.2 Oogenesis

UNIT-2 Fertilization

UNIT-3 Cleavage

UNIT-4 Placenta, types& their Function

Books recommended

Biochemistry

1. Boyer: Concepts in Biochemistry (3rd ed. 2006, Brooks/Cole)
2. Lehninger, Nelson & Cox: Principles of Biochemistry (4th ed, 2007, Worth),
3. Murray *et al*: Harper's Biochemistry (25th ed. 2000, Appleton & Lange)
4. Stryer: Biochemistry (5th ed. 2001, Freeman)

Physiology

1. Nielson: Animal Physiology – Adaptation and Environment (5th ed. 2008, Cambridge)
2. Marshall and Hughes: Physiology of Mammals and Vertebrates (2nd ed. 1980, Cambridge)

Developmental biology

1. Balinsky: An Introduction to Embryology (1981, CBS)
2. Gilbert: Developmental Biology (8th ed., 2006, Sinauer)
3. Wolpert: Principles of Development (3rd ed. 2007, Oxford)

B.Sc. Zoology –Generic Elective

B.Sc. Semester III

ZOO-H-GE-303-P

BIOCHEMISTRY, PHYSIOLOGY & DEVELOPMENTAL BIOLOGY

Credit – 2

Lectures - 30

F.M:25 (20 Ext. + 05 Int.)

F.M - Time: 1 and half Hr

Practical

FM:20

1. Detection of presence of biomolecules in the sample	05
2. Physiology Experiment	05
3. Spotting:	05
a. Slides of reproductive organ	01
b. Slides of General organ	01
c. Endocrine Slide	01
d. Slides of Development Biology	02
4. Practical Records & Viva	05

Total=20

Suggested Practical

Biochemistry, Physiology and Development Biology

1. Biochemical test for Protein carbohydrates (Starch & Glucose) & Lipids
2. Determination of Hb%
3. Determination of Bleeding and Clotting time
4. Records of Blood Pressure in Normal & after exercise
5. Study of Permanent Slides : T.S of stomach, intestine, kidney, lungs, liver
6. Study of Slides of Reproductive organ: Testis, Ovary & Uterus
7. Study of Endocrine Glands Slides: Thyroid, Adrenal & Pancreas
8. Study of Permanent Slides of Chick Embryo (WM)-18 hrs, 24 hrs, 36 hrs, 48 hrs & 72 hrs

B.Sc. Zoology –Generic Elective

B.Sc. Semester IV

ZOO-H-GE-404-T

- In all nine questions are to set of equal values and five questions are to be answered of which question no 1 will be compulsory
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 - Group A will comprise questions no.1 which will consist of two parts A & B. Part A will be MCQs type, covering entire syllabus and carry one mark each ($1 \times 6 = 6$) and part B will comprise short answer, three mark each ($3 \times 2 = 6$).
 - Rests eight questions will be of long type set from the whole syllabus in Group B. Examinees are required to answer any four from the group.
 - The question no. 9 will be of short notes type each carrying six marks ($6 \times 2 = 12$) in which only two should be answered out of four options.
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ECOLOGY & ECONOMIC ZOOLOGY

Credit-04

Lectures-60

F.M: 75 (60 Ext. + 15 Int.)

Ecology

UNIT1. General Concept

- 1.1 Ecosystem
- 1.2 Food Chain & Food web & Ecological Pyramids
- 1.3 Energy flow
- 1.4 Bio-Geochemical Cycle: Nitrogen & Carbon

UNIT 2. Population and Communities

- 2.1 Ecological Succession

UNIT 3. Environmental Pollution

- 3.1 Pollution Sources & Impacts of Environmental Pollution-Air & Water
- 3.2 Green House Gases and Effects

UNIT 4. Natural Resources and Conservation

- 4.1 Renewable & Non-renewable Energy Source

Economic Zoology

UNIT-1 Apiculture:

- 1.1 Types
- 1.2 Caste of honey bee
- 1.3 Disease
- 1.4 Economic importance

UNIT-2 Sericulture:

- 2.1 Types
- 2.2 Disease
- 2.3. Economic importance

UNIT-3 Lac culture:

- 3.1. Species
- 3.2 Methods
- 3.3 Economic importance

Books Recommended

1. Colinnvaux ,P.A.(1993). Ecology. II Edition .Wiley Johnand sons,Inc.
2. Kerbs,C,J.(2001),Ecology.Vi Edition ,Benjamin Cuming
3. Odum,E.P.,(2008), Fundamentals of Ecology and field Biology, Harpper and Row publishers
4. Ecology Environment and Resources conservation: J.S. Singh, S.p.Singh and S R Gupta , Anamaya Publishers, New Delhi

B.Sc. Zoology –Generic Elective

B.Sc. Semester IV

ZOO-H-GE-404-P

ECOLOGY & ECONOMIC ZOOLOGY

Credit – 2

Lectures - 30

F.M:25 (20 Ext. + 05 Int.)

F.M - Time: 1 and half Hr

Practical

FM:20

1. Ecology Practical

05

2. Spotting

a. Slides of Economic zoology

2×2=04

b. Specimens of Economic Zoology

2×3=06

3. Practical Records & Viva

05

Total=20

List of Suggested Practical's

Ecology

1. Study of aquatic animals, phytoplankton and zooplankton
2. Determination of pH in soil and water
3. Estimation of free carbon di oxide
4. Model of food chain

Economic Zoology

1. Slides of – Mouth part of culex, anopheles, Plasmodium (Signet ring)
2. Common paddy and sugar cane pest,
3. Life cycle of Honey bee,
4. Cocoon of silkworm
5. Lack infestation on stick