

KOLHAN UNIVERSITY

CHAIBASA



COURSE CURRICULUM FOR POST GRADUATE COURSES UNDER CHOICE BASED CREDIT SYSTEM

B.Sc. Zoology [Honours]

Upgraded Syllabus

WITH EFFECT FROM 2020

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ZOOLOGY HONOURS

KOLHAN UNIVERSITY, CHAIBASA

B. Sc. Zoology Honours

MARKS DISTRIBUTION

Semester	Course	Name of Paper	No. of Credits	Total Credits	Full Marks	TOTAL
I	CCZOO 1 Theory	Systematics & Animal diversity	4	20	70	350
	CCZOO2 Theory	Animal Form and Function of Invertebrates	4		70	
	CCZOO Practical		4		60	
	AECC1 Compulsory	MIL Communication	2		50	
	Generic Elective1	GE-1 (Theory)	4		50	
	Generic Elective (P)	GE-1 (practical)	2		30	
II	CCZOO3 Theory	Cell Biology	4	20	70	350
	CCZOO4 Theory	Diversity of Chordata	4		70	
	CCZOO Practical		4		60	
	AECC2 Compulsory	Environmental Science	2		50	
	Generic Elective2	GE-2 (Theory)	4		70	
	Generic Elective (P)	GE-2 (practical)	2		30	
	CCZOO5 Theory	Physiology	4		70	

III	CCZOO6Theory	Endocrinology and Animal Physiology	4	26	70	450
	CCZOO7 Theory	Developmental Biology	4		70	
	CCZOO Practical		6		90	
	SEC 1	Current Affairs	2		50	
	Generic Elective-3	GE-3 (Theory)	4		100	
	Generic Elective (P)	GE-3 (practical)	2			
IV	CCZOO8 Theory	Genetics	4	26	70	450
	C9Theory	Evolution	4		70	
	C10 Theory	Animal behaviour	4		70	
	CCZOO Practical		6		90	
	SEC2	Personality Development	2		50	
	Generic Elective-4	GE-4 (Theory)	4		70	
	Generic Elective	GE-4 (practical)	2		30	
V	CCZOO11Theory	Immunology	4		70	400
	CCZOO12 Theory	Environmental biology & toxicology	4		70	
	CCZOO Practical		4		60	

	DSE1Theory	Economic Zoology	4		70	
	DSE2 Theory	Biostatistics	4		70	
	DSE Practical		4	24	60	
VI	CCZOO13Theory	Molecular biology & Biotechnology	4		70	
	CCZOO14 Theory	Microbiology & Medical Zoology	4		70	400
	CCZOO Practical		4		60	
	DSE3Theory	Toxicology	4		70	
	DSE3Practical		2	24	30	
	DSE4	Project	6		100	
		TOTAL		140		2400

- **CIA** :- *Continuous Internal Assessment* .
- **AECC** :- *Ability Enhancement Compulsory Course* .
- **SEC** :- *Skill Enhancement Course* .

Details of courses under B.Sc. (Zoology Honours)

Course	Theory+ practical
I. Core Course	
(14 Papers)	14x4=56
Core course Practical/Tutorial*	
(14 Papers)	14x2=28
II. Elective Course	
(8 papers)	
A.1. Discipline Specific Elective	4x4=16
(4 papers)	
A.2. Discipline Selective Elective	
Practical/Tutorial*	4x2=8
(4 Papers)	
B.1. Generic Elective/Interdisciplinary	
(4 Papers)	4x4=16
B.2. Generic Elective	
Practical/Tutorial*	4x2=8
(4 Papers)	
<ul style="list-style-type: none"> • Optional Dissertation or project work in place of one Discipline Specific Elective paper (6 Credits) in 6th Semester 	
III. Ability Enhancement Courses	
1. Ability Enhancement Compulsory Courses (AECC)	
(2 Papers of 2 Credits each)	2x2=4
Environmental Science	
English/ MIL Communication	
2. Skill Enhancement Courses (SEC)	
(Minimum 2)	2x2=4

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

SEMESTER-I

COURSE	Code Of Papers	Name of Papers	Credit	Total Credit
CORE Course	CZOOOL-1	Systematics & Animal diversity	04	12
	CZOOOL-2	Animal Form and Function of Invertebrates	04	
	P-1	Practical based in CZOOOL -1 & 2	04	
AECC Ability Enhancement Compulsory Course	AECC-1	Communicative English Basic of computers /	02	02
Generic Elective	GE-1	GE-1 (Theory)	04	06
		GE-1(Practical)	02	
			Total credits	20

Semester - II

COURSE	Code Of Papers	Name of Papers	Credit	Total Credit
Core Course	CZOOL-3	Cell Biology	04	12
	CZOOL-4	Diversity of Chordata	04	
	P-2	Practical based on CZOOL-3 & 4	04	
AECC Ability Enhancement Compulsory Course	AECC-2	Environmental Science	02	02
Generic Elective	GE-2	GE-2 (Theory)	04	06
		GE-2(Practical)	02	
			Total	20

Semester -III

COURSE	Code Of Papers	Name of Papers	Credit	Total Credit
Core Course	CZOOL-5	Physiology	04	18
		Endocrinology and Animal Physiology	04	
	CZOOL-7	Developmental Biology	04	
		P-3	Practical based on CZOOL-5,6&7	
(B) Skill Enhancement Course	SEC-1	Current Affairs	02	02
Generic Elective	GE-3	GE-3 (Theory)	04(T)	06
		GE-3 (Practical)	02	
			Total	26

Semester -IV

COURSE	Code Of Papers	Name of Papers	Credit	Total Credit
Core Course	CZOOOL-8	Genetics	04	18
	CZOOOL-9	Evolution	04	
	CZOOOL-10	Animal behaviour	04	
	P-4	Practical based on CZOOOL-8,9 & 10	06	
(B) Skill Enhancement Course	SEC-2	Personality Development	02	02
Generic Elective	GE-4	GE-4 (Theory)	04	06
		GE-4 (Practical)	02	
			Total	26

SEMESTER - V

COURSE	Code Of Papers	Name of Papers	Credit	Total Credit
Core Course	CZOOOL-11	Immunology	04	12
	CZOOOL-12	Environmental biology & toxicology	04	
	P-5	Practical based on CZOOOL-11& 12	04	
Discipline specific Elective	DSE-1	Economic Zoology	04	12
	DSE-2	Biostatistics	04	
	P-6	Practical based on DSE-1 & DSE-2	04	
			Total	24

SEMESTER- VI

COURSE	Code Of Papers	Name of Papers	Credit	Total Credit
Core Course	CZOOOL-13	Molecular biology & Biotechnology	04	12
	CZOOOL-14	Microbiology & Medical Zoology	04	
	P-74	Practical based on CZOOOL-11& 12	04	
Discipline specific Elective	DSE-3	Toxicology	04	12
	DSE-4	Project Work	04	
	P-8	Practical based on DSE-3	04	
			Total	24

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 [Honours]

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 Honours in Zoology
(Six Semester Course)**

1ST SEMETER

ZOOLOGY HONOURS

B.Sc. (Hons.) Zoology**Semester- I , Core Course (CZOOL-1)****Systematics and Animal Diversity****Credit 4****Full Marks = 70
Hours of Teaching = 60 hrs.**

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 **five questions of fifteen marks each**, out of which any three are to answer.

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

UNIT-1 Systematics

- 1.1. Binomial & Trinomial nomenclature,
- 1.2. Concept of Species.
- 1.3. New trends in animal Taxonomy.
- 1.4. Biological Classification

UNIT-2 Non-Chordates

- ❖ General characters and classification of the following up to orders with examples showing distinctive / adaptive features

- 2.1. Protozoans
- 2.2. Poriferans
- 2.3. Cnidarians
- 2.4. Ctenophorans
- 2.5. Platyhelminths
- 2.6. Annelids.
- 2.7. Arthropoda
- 2.8. Molluscs
- 2.9. Echinoderms

UNIT-3

- 3.1. Life cycle of *Fasciola hepatica* and *Ascaris*
- 3.2. Parasitic Adaptation in Helminthes

UNIT-4 General Characters and affinities of

- 4.1. Ctenophora- Evolutionary Significance
- 4.2. Onychophora- Evolutionary Significance

Semester -1, Core Course (CZ00L-2)

Animal Form and Function of Invertebrates

Credit 4

Full Marks = 70
Hours of Teaching = 4 ×15 =60 hrs.

UNIT-1 Phylum Protozoa

- 1.1 Locomotion, Osmoregulation and reproduction in protozoa.
- 1.2 Nutrition in protozoa.

UNIT-2 Phylum Porifera

- 2.1 Canal system in Porifera
- 2.2 Skeletal system of porifera.

UNIT-3 Phylum Coelenterate

- 3.1 Obelia -Life cycle and metagenesis
- 3.2 Polymorphisms in hydrozoa
- 3.3 Coral and Coral Reefs -types, formation, distribution and economic importance.

UNIT-4 Phylum Platyhelminthes

- 4.1 Life cycle of Fasciola hepatica

UNIT-5 Phylum Annelida

- 5.1 Excretion in Annelida

UNIT-6 Phylum Arthropoda

- 6.1 Respiration in Arthropods
- 6.2 Larval forms of Crustacea

UNIT-7 Phylum Mollusca

- 7.1 Respiration in Pila and Unio
- 7.2 Torsion and Detorsion in Gastropods

UNIT-8 Phylum Echinodermata .

- 8.1 Water vascular System in Echinoderms
- 8.2 Larval forms of echinoderms

P-1 Practical Based on (CZOOL-1 & CZOOL-2)**Full Marks = 60**

<u>ITEM</u>	<u>MARKS DISTRIBUTION</u>
1. Dissection.	10
2. Spotting (10)	30
3. Whole mount	05
✓ Nephridia of earthworm.	
✓ Statocyst of palaemon.	
4. Practical Record	10
5. Viva Voce	05

P-1 Practical Based on (CZOOL-1 & CZOOL-2)
Details

Credit 4

Hours of Practical :- 4X15=60 hrs.

1. Dissection :-

- ✓ Nervous system of earthworm.
- ✓ Nervous system of palaemon .
- ✓ Nervous system in pila.

2. Whole mount:-Spotting

- ✓ Nephridia & Ovary of earthworm.
- ✓ Statocyst of Palaemon.

3. Systematics and Animal Diversity :- spotting

1. Study of Museum Specimens of animals
 - ✓ Sycon,
 - ✓ Fasciola(as an example of triploblastic acoelomate animal),
 - ✓ Ascaris(as an example of triploblastic pseudocoelomate animal),
 - ✓ Hirudinaria (as an example of triploblastic schizocoelomate animal),
2. Study of the following through permanent slides
 - ✓ Paramecium Slide (WM)
 - ✓ Hydra (as an example of diploblastic animal)
 - ✓ Gemmules of sponges
 - ✓ Conjugation in Paramecium, ,
 - ✓ Nauplius, Zoea larvae, Bipinnaria, Redia Cercaria etc.

4. Dissection & Mounting:-

1. Dissection of Digestive and nervous system of Earthworm
2. Mounting of nephridia, ovary of earth worm
3. Study and mounting of cephalic appendages of Palaemon
4. Mounting of statocyst of Palaemon

Recommended Books

1. Dalela & Sharma: Animal Taxonomy and Museology (1976, Jai PrakashNath).
2. Kapoor: Theory and Practicals of Animal Taxonomy (1988, Oxford & IBH).
3. Simpson: Principles of Animal Taxonomy (1962, Oxford).
4. Roymahoney: Laboratory Techniques in Zoology (1966, Butterworths).
5. Mayer & Ashlock: Principles of Systematic Zoology (1991, McGraw Hill).
6. Boolotian & Stiles: College Zoology (10th ed 1981, Macmillan)
7. Campbell & Reece: Biology (7th ed 2005, Pearson)
8. Dorit, Walker & Barnes: Zoology (1991, Saunders)
9. Taylor, Green & Stout : Biological Sciences (3rd ed. 2005, Cambridge)
10. Mader: Biology (9th ed. 2007, W.C. Brown)
11. Marshall & Williams: Textbook of Zoology, Vol. I (2005, Macmillan)
12. Parker & Haswell, 7th ed. 1972, Macmillan)
13. Nigam: Biology of Non-chordates (1997, S Chand)
14. Parker & Haswell: Text Book of Zoology, Vol. II (2005, Macmillan)
15. Purves et al: Life-the Science of Biology, (7th ed. 2004, Sinauer)
16. Starr: Biology, Concepts and Applications (1991, Wadsworth)
17. Tortora and Anagnostakos: Principles of Anatomy and Physiology (6th ed. 1986, Harper & Row).
18. Villee, Walker & Baranes: General Zoology (5th ed 1979, Saunders)
19. Wolfe: Biology – the Foundations (1987, Wadsworth)
20. Schmidt Nielson: Animal Physiology (5th ed. 2005, Cambridge)
21. Arms and Camp: Biology (4th ed. 1995)
22. Barnes, R.D. (1982). Invertebrate Zoology, V Edition. Holt Saunders International Edition.
23. 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
24. Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson
25. Boradale, L.A. and Potts, E.A. (1961). Invertebrates: A Manual for the use of Students. Asia Publishing Home.
26. Singh, S. Keshari S. and Abhishek, K.S. (2016). Medical Zoology and Parasitology, Jharkhand Jharokha, Classical Publishing Company.

**PROPOSED SYLLABUS FOR CHOICE BASED CREDIT
SYSTEM**

**B.Sc Honours in Zoology
(Six Semester Course)**

IInd SEMETER

ZOOLOGY HONOURS

B.Sc. (Hons.) Zoology

Semester II , Core Course (CZOOOL-3)

Diversity of Chordate

Credit-4

**Full Marks = 70
Hours of Teaching: - 4X15=60 hrs.**

UNIT-1 Introduction to Chordata:

General characters and outline classification

UNIT-2 Protochordates:

2.1 General account & affinities of Hemichordata ,Urochordates, Cephalochordates,

2.2 Retrogressive metamorphosis in Urochordates (Herdmania).

UNIT-3 Agnatha:-

3.1 Silent features, classification up to orders and affinities of Cyclostomes.

UNIT-4 Fishes/Pisces :-

4.1 Gill structure and Respiration in Chondrichthyes and Osteichthyes

4.2 Accessory Respiratory system of fishes.

UNIT-5 Amphibia(Classification) :-

5.1 Parental Care of Amphibia.

5.2 Origin & evolution of amphibians,

5.3 Neoteny with special reference to Axolotl larvae.

UNIT-6 Reptilia :- (Classification)

- 6.1 Biting & feeding mechanism of Snakes.
- 6.2 Poison-Apparatus, Venom in Ophidians

UNIT-7 Aves :-

- 7.1 Origin of birds,
- 7.2 Archaeopteryx a connecting link,
- 7.3 Flight adaption and migration in birds

UNIT-8 Mammals :-

- 8.1 General account of Affinities of Prototheria and Metatheria

UNIT -9 Comparative Anatomy

- 9.1 Comparative anatomy of heart, integument and aortic Arches in vertebrates

**Semester II, Core Course (CZOOL-4)
Cell Biology**

Credit-4

**Full Marks = 70
Hours of Teaching :- 4X15=60**

UNIT-1 The Cell and its Organization

- 1.1 Introduction to cell theory
- 1.2 Structure and function of plasma membrane
- 1.3 Endo-membrane system (endoplasmic reticulum, Golgi complex, lysosome), Protein Sorting, , Polymorphism in Lysosome
- 1.4 Structure and function of Mitochondria, Role in Oxidative Phosphorylation
- 1.5 Structure of prokaryotic & Eukaryotic cells .

UNIT-2 Nucleus

- 2.1 Introduction to polytene and lampbrush chromosomes, Aberration[structural change]
- 2.2 Organisation of Chromatin, Nucleosome, Euchromatin and Heterochromatin
- 2.3 Nucleolus

UNIT-3 Cell reproduction

- 3.1 Basis feature of cell cycle and its regulation
- 3.2 Mitosis & Meiosis

UNIT-4 Elementary idea of cancer

- 4.1 Oneogenes, Metastasis,

4.2 Apoptosis

UNIT-5 Cytoskeleton

5.1 Structure and function: Microtubules, Microfilament, and Intermediate filaments.

UNIT-6 Transport Across Plasma Membrane

6.1 Active and Passive transport

6.2 Facilitated transport

6.3 Modification of Plasma Membrane (Cell junctions: Occluding junctions (Tight junctions), anchoring junctions (desmosomes) and communicating junctions (gap junctions).

UNIT-7 Cell Signalling

7.1 Role of Second Messenger (cAMP).

ZOOLOGY HONOURS

P-2 Practical based on CZOOL-3 & CZOOL-4**Full Marks = 60**

<u>ITEM</u>	<u>MARKS DISTRIBUTION</u>
1. Dissection.	10
2. Spotting (10)	30
3. Mounting of Scale of Fishes	05
4. Slides Preparation	05
5. Practical Record	05
6. Viva Voce	05

P-2 Practical based on CZOOL-3 & CZOOL-4

Working hours -60

1. Dissection to show afferent and efferent branchial arteries of Scoliodon or Bony Fish.
2. Mounting:-
 - Mounting of Scale of Fishes, [Scoliodon , Bony Fishes]
3. Slide Preparation :-
 - Preparation of mitotic slides from onion root tips, Grasshopper Testis.
 - Study of Blood cells through slide preparation.
4. Study of slides of Unicellular Eukaryotic cell -Amoeba, Paramoecium
5. Study of various stages of cell division through permanent slides-Mitosis and Meiosis.
6. Study of Museum Specimens :-
 - Protochordata :- Balanoglossus, Herdmania, Branchiostoma(Amphioxus)
 - Agnatha :- Petromyzon, Myxine
 - Fishes :- Scoliodon, Torpedo, Chimaera, Mystus, Heteropneustes, Labeo, Exocoetus, Echeneis, Anguilla, Hippocampus, Anabas, Tetraden
 - Amphibia :- Ichthyophis, Necturus, Bufo, Hyla, Alytes, Salamandra
 - Reptilia :- Chelone, Hemidactylus, Varanus, Uromastix, Chamaeleon, , Draco, Bungarus, Vipera, Naja, Hydrophis Key for Identification of poisonous and non-poisonous snakes
 - Aves: - Study of six common birds from different orders. Types of beaks and claws
 - Mammalia :- Bat (Insectivorous and Frugivorous), Funambulus, Loris

Recommended Books

Cell Biology

1. Alberts et al: Essential Cell Biology (1998, Garland)
2. Alberts et al: Molecular Biology of the Cell (2008, Garland)
4. Karp: Cell and Molecular Biology (2008, John Wiley)
5. Lodish et al: Molecular Cell Biology (2008, Freeman)204
6. Pollard & Earnshaw: Cell Biology (2002, Saunders)
7. Cooper and Hausman: The Cell A Molecular approach (2007, Sinauer)
8. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.

Vertebrate Zoology

1. Nigam: Biology of Chordates (1997, S Chand)
2. Hoar: General and Comparative physiology (7thed. 2005), Indian reprint.
3. Miller & Harley: Zoology (6thed. 2005, W.C. Brown
4. Vertebrate R.l. Kotpal

**PROPOSED SYLLABUS FOR CHOICE BASED CREDIT
SYSTEM**

**B.Sc Honours in Zoology
(Six Semester Course)**

IIIrd SEMETER

CZOOOL - 5 Mammalian Physiology

Credit -5(T) + 1(P)

CZOOOL - 6 Endocrinology and Animal Physiology

Credit -5(T) + 1(P)

CZOOOL - 7 Developmental Biology

Credit -5(T) + 1(P)

Semester :- III

CZ00L-5:- Mammalian Physiology

Full Marks = 70
Total Teaching hrs: 75

UNIT-1. Respiration

- 1.1 Mechanism and regulation of breathing
- 1.2 Transport of oxygen and carbon dioxide
- 1.3 Histology of trachea and lung

UNIT-2. Circulation

- 2.1 Composition and function of blood .
- 2.2 Structure and function of Hb.
- 2.3 Blood groups and Rh factor
- 2.4 Homoeopoesis
- 2.5 Blood coagulation

UNIT3. Nutrition and Digestion

- 3.1. Digestion of carbohydrates, proteins and fats in mammals

UNIT-4. Excretion

- 4.1. Strucure of Kidney & function.

UNIT-5. Nervous System

- 5.1 Structure and types of Neuron

5.2 Conduction of Nerve impulse through Axon and Synapse

5.3 Reflex Action

UNIT-6. Reproduction

6.1 Histological details of testes and functions

6.2 Histological details of ovary and functions

6.3 Reproductive Cycle

6.4 Methodology of Contraception in Male and Female

UNIT-7. Muscles

7.1 Histology of different types of muscles

7.2 Ultra structure of skeletal muscle

7.3 Molecular and chemical basis of muscle contraction

ZOOLOGY HONOURS

CZ00L:- 6 Endocrinology and Animal Physiology

Teaching Hrs.75

UNIT-1.Hormonal Messenger :-

- 1.1 Hormones and its classification
- 1.2 Neurotransmitters
- 1.3 Mode of hormone action
- 1.4 Neurosecretion and Neurohormone

UNIT -2 Structure and function of endocrine glands

- 2.1 Pituitary
- 2.2 Thyroid
- 2.3 Adrenal
- 2.4. Pancreas, Pineal and Parathyroid

UNIT-3 Endocrine Disorders:

- 3.1. Goitre,
- 3.2. Cushing's Disease,
- 3.3. Addison's Disease

UNIT-4 Tissues:-

- 4.1. Structure, location, classification and functions of Epithelial, Connective & Muscular tissue.

UNIT-5 Bone and Cartilage

CZOOOL :-7 :-Developmental Biology

Full Marks = 70

Teaching Hrs. 75

UNIT-1 Gametogenesis and Fertilization

- 1.1 Spermatogenesis and Oogenesis
- 1.2 Pre fertilization Events: Attraction of gametes, Acrosomal Reaction,
- 1.3 Post fertilization events- Prevention of Polyspermy, Cortical reaction

UNIT-2 Early Embryonic Development

- 2.1 Types of vertebrate egg
- 2.2 Patterns of cleavage
- 2.3 Gastrulation, morphogenetic movements

UNIT-3 Late Embryonic Development

- 3.1. Extra embryonic membranes in chick
- 3.2. Placenta (Structure Type and function)

UNIT-4 Post Embryonic Development

- 4.1. Metamorphosis in frog
- 4.2. Regeneration (Epimorphosis, morphallaxis and compensatory regeneration (with one example each)
- 4.3. Concepts of Ageing

UNIT-5 Implications of Developmental Biology

- 5.1 In vitro fertilization,
- 5.2 Stem cell culture (ESC), Amniocentesis,

UNIT-6 Embryonic Induction

- 6.1 Organizer's Concept
- 6.2 Fate Maps (Techniques)

ZOOLOGY HONOURS

Practical on Paper :- CZOOL-5, CZOOL-6 & CZOOL-7

Total Practical hours -90

Mammalian Physiology (15 marks)

1. Preparation of Haemin Crystal
2. RBC count by using haemocytometer
3. Estimation of Haemoglobin using Sahil's method
4. Record of blood pressure by Sphygmomanometer
5. Study of permanent slide of transverse section of organs:
6. Lung, Stomach, liver, kidney, intestine

Endocrinology and Animal Physiology (10 marks)

1. Study of permanent slide of Endocrine gland: Thyroid, Islets of Langerhans, Adrenal, Pituitary, Testis, Ovary

Developmental Biology (20 marks)

1. Study of permanent Slide of Frog Embryo (W.M)
2. Study of permanent slide of chick embryo (W.M) - Primitive streak (13 and 18 hours), 21, 24, 28, 33, 36, 48, 72, and 96 hours of incubation (Hamilton and Hamburger stages)
3. Study of Life cycle through Models/specimens of Silk worm, Lac Insect/Honey bee.

Class Work And Records (5marks)

Viva_Voce (10 marks)

Recommended Books

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)
3. Hoar: General and Comparative Physiology (3rd ed., 1987, Prentice Hall)
4. Prosser: Comparative Animal Physiology (4th ed. 1991, Satish Book)
5. C.C.Chaterjee Medical physiology
6. Guyton- a book on medical physiology

Endocrinology

1. Hadley: Endocrinology (5th ed. 2000, Prentice Hall)
2. Turner and Bagnara: General Endocrinology, 6th ed.1984, Saunders)

Developmental Biology

1. Alberts *et al*: Molecular Biology of the Cell (2008, Garland)
2. Balinsky: An Introduction to Embryology (1981, CBS)
3. Gilbert: Developmental Biology (8th ed., 2006, Sinauer)
4. Wolpert: Principles of Development (3rd ed. 2007, Oxford)

**PROPOSED SYLLABUS FOR CHOICE BASED CREDIT
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B.Sc Honours in Zoology
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IVth SEMETER**

CZOOOL -8 Genetics

CZOOOL -9 Evolutions and Animal Behavior

CZOOOL -10 Biochemistry

Credit -5(T) + 1(P)

Credit -5(T) + 1(P)

Credit -5(T) + 1(P)

Semester IV

CZOOOL -8 : Genetics

Full Marks = 70

Total Teaching hrs: 75

Unit 1: Mendelian Genetics and its Extension

- 1.1 Principles of inheritance, Incomplete dominance and co-dominance.
- 1.2 Multiple alleles, lethal alleles, Epistasis, Pleiotropy.
- 1.3 Sex-linked, sex-influenced and sex-limited characters' inheritance.

Unit 2: Linkage, Crossing Over and Chromosomal Mapping

- 2.1 Linkage and crossing over, Cytological basis of crossing over,
- 2.2 Molecular mechanisms of crossing over including models of recombination, Recombination frequency as a measure of linkage intensity

Unit 3: Mutations

- 3.1 Types of gene mutations (classification),
- 3.2 Chromosomal aberrations (classification, figures and with one suitable examples of each);
- 3.3 genetic disorders (Down syndrome, Turners syndrome, Klinefelter syndrom Cri-du-chat, leukemia).

Unit 4: Sex Determination

- 4.1 Chromosomal mechanisms of sex determination in Drosophila and Man.

Unit 5: Extra-chromosomal Inheritance

Criteria for extra-chromosomal inheritance, Antibiotic resistance in Chlamydomonas, Mitochondrial mutations in Saccharomyces, Infective heredity in Paramecium and Maternal effects.

Unit 6: Recombination in Bacteria and Viruses

Conjugation, Transformation, Transduction, Complementation test in Bacteriophage.

CZOOOL :- 9 : Evolution and Animal Behaviour

Teaching Hrs.60

UNIT-1 History of diversified life

- 1.1. Geological Time Scale And Geological Era
- 1.2. Zoogeographical regions (Oriental, Australian and Ethiopian Regions/Realms)

UNIT -2 Introductions to evolutionary Theories

- 2.1 Lamarkism
- 2.2 Darwinism
- 2.3 Neo Darwinism

UNIT-3. Source of heredity variation and evolution

- 3.1. Isolation
- 3.2. Natural Selection, types
- 3.3. Speciation
- 3.4. Evolution of Man and Horse

UNIT-4 .Hardy Weinberg law of Equilibrium

- 4.1. Genetic Drift
- 4.2. Founder effect

UNIT-5. Concepts and pattern of Behaviors

- 5.1 Innate Behaviors
- 5.2 learned behavior

UNIT-6. Social organization in insects: -

- 6.1. Honey Bee dance,
- 6.2 Different insect societies.

CZ00L -10 :- Biochemistry

Credit 4(T) +2(P)

Teaching Hrs.60(T)+30(P)

Unit 1: Carbohydrates

Structure and biological importance; monosaccharides, disaccharides, polysaccharides and glycoconjugates.

Unit 2: Lipids

Structure and significance; physiologically important saturated and unsaturated fatty acids; triacylglycerols, phospholipids, glycolipids and steroids.

Unit 3: Proteins

Amino acids: Structure, classification and general properties of α -amino acids; physiological importance of essential and non-essential amino acids; Urea cycle.

Proteins: Bonds stabilizing protein structure; levels of organization in proteins; Denaturation; Introduction to simple and conjugate proteins.

Immunoglobulins: Basic structure, classes and function,

Unit 4: Nucleic Acids

Structure: Purines and pyrimidines, nucleosides, Nucleotides, Nucleic acids; Base pairing, denaturation and Renaturation of DNA. Types of DNA and RNA.

Unit 5: Enzymes

Nomenclature and classification; Introduction; cofactors; Specificity of enzyme action; Mechanism of action; Enzyme kinetics; Factors affecting rate of enzyme-catalyzed reactions; Enzymes inhibition; Allosteric enzymes and their kinetics; Regulation of enzyme action; coenzymes and isoenzymes.

UNIT-6. Metabolic path way

6.1 Glycolysis

6.2 Krebs's cycle

Practical based on CZOOL-8, CZOOL-9 & CZOOL-10**CZOOL-8 Genetics****Credit - 2****CZOOL-9 Evolution****Credit - 2****CZOOL-10 Biochemistry****Credit - 2****Genetics(20 marks)**

1. Simulation of principles of segregation and independent assortment using coloured beads. Application of law of probability and chi-square test.
2. Study of pattern of inheritance in human population of the traits Rolling of tongue and interlocking, and of the sex-influenced trait long vs short second finger in relation to the Fourth finger (apply Hardy-Weinberg law).
3. Study of mutants in *Drosophila* (Bar eye, white eye, yellow body, sepia eye, curled wing, Dumpy wing, vestigial wing and sepia eye-curved wing and curled wing-ebony body-sepia Eye.
4. Genotype analysis in the pedigree chart of the Victorian family affected with haemophilia

Evolution (20 marks)

1. Genotypic analysis of blood groups in human population to estimate allele frequencies by Hardy -Weinberg equation
2. Fossils - One representative fossil each from Foraminifera, Brachiopoda, Trilobita, Archeopterex, Ammonites, Echinodermata. Living fossils (Limulus, Peripatus, Sphenodon)
3. Evolution of Horse - through models
4. Study of Serial homology exhibited by teeth and appendages
5. Study of Homologous and Analogous organ .

Animal Behaviour (20 marks)

1. Study of geo-taxis, photo-taxis, hydro-taxis in animals.
2. Locomotory behaviours of dipterans larvae(Housefly/blowfly/fruitfly)

4. Locomotion on different types of substrata (writing paper, plastic sheet and sand paper)
5. Study of bee hive and mound of termites.

Bio- Chemistry (10 marks)

1. Benedict's test for sugar .
2. Millon's test for Protein .
3. Quantitative test of functional groups in carbohydrates, proteins and lipids.
4. Paper chromatography of amino acids.
5. Action of salivary amylase under optimum conditions.
6. Effect of pH, temperature and inhibitors on the action of salivary amylase.
7. Demonstration of proteins separation by SDS-PAGE.

Seasonal and project Work (10 marks)

Viva -voce (10 marks)

ZOOLOGY HONOURS

Recommended Books

Genetics

1. Brooker: Genetics : Analysis and Principles (1999, Addison-Wesley,)
2. Gardner *et al*: Principles of Genetics (1991, John Wiley)
3. Griffith *et al*: An Introduction to Genetic Analysis (2005, Freeman)
4. Hartl & Jones: Essential Genetics: A Genomic Perspective (2002, Jones & Bartlett)
5. Russell: Genetics (2002, Benjamin Cummings)
6. Snustad & Simmons: Principles of Genetics (2006, John Wiley)
7. Lewin: Genes IX (2008, Jones & Bartlett)

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)

Animal Behaviour

1. Drickamer & Vessey : Animal Behaviour - concepts, processes and methods (2nd ed. 1986, Wadsworth,)
2. Freeland: Problems in Practical Advanced Level Biology (1985, Hodder & Stoughton,)
3. Goodenough et al.: Perspectives on Animal Behaviour (1993, Wiley)
4. Grier: Biology of Animal Behaviour (1984, Mosby)
5. Lorenz: The Foundation of Ethology (1981, Springer)
6. Manning & Dawkins: An Introduction to Animal Behaviour (5th ed. 1998, Cambridge).
7. Mcfarland : Animal Behaviour, Psychology, Ethology and Evolution (1985, Pitman).
8. Slater: An Introduction to Ethology (1985, Cambridge).

Bio-Chemistry

1. Cox, M.M and Nelson, D.L. (2008). *Lehninger Principles of Biochemistry*, V Edition, W.H. Freeman and Co., New York.
2. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). *Biochemistry*, VI Edition, W.H.Freeman and Co., New York.
3. Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009,). *Harper's Illustrated Biochemistry*, XXVIII Edition, International Edition, The McGraw-Hill Companies Inc.
4. Hames, B.D. and Hooper, N.M. (2000). *Instant Notes in Biochemistry*, II Edition ,BIOS Scientific Publishers Ltd., U.K.

ZOOLOGY HONOURS

**PROPOSED SYLLABUS FOR CHOICE BASED CREDIT
SYSTEM**

B.Sc. Honours in Zoology

(Six Semester Course)

Vth SEMETER

CZOO-11 Microbiology & Immunology

Credits 4 (T) +2 (P)

CZOO-12 Environmental biology

Credits 4 (T) +2 (P)

DSE-1 Economic Zoology

Credits 4 (T) +2 (P)

DSE-2 Biostatistics

Credits 4 (T) +2 (P)

B.Sc. Zoology Honours .

Semester V

CZ00L-11 Microbiology & Immunology

Credit 4 (T) +2 (P)

Teaching Hours 60 (T)+30(P)

Microbiology

UNIT-1. Microbial diversity

- 2.1 Viruses
- 2.2. Bacteria
- 2.3. Eukaryotic microorganisms

UNIT-2. Techniques in microbiology

- 2.1. Classification of bacteria based on staining of microbes

UNIT-3. Pathogenic microbes

- 3.1 Mycobacterium
- 3.2 HIV
- 3.3 COVID -19

UNIT-4. Applied microbiology

- 4.1 Vaccine and its preparation
- 4.2 Antibiotic and sensitivity

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

3.3 Antigen - Antibody reactions

UNIT- 4. Cell mediated immunity

4 .1.Function of T-Cells

UNIT- 5. Immunoglobulin

5.1 Structure and Function of different classes of Immunoglobulin

UNIT-6. Cytokines

Properties and functions of cytokines, Therapeutics Cytokines.

UNIT-7. Vaccines

Types of vaccines: Recombinant vaccines and DNA vaccines

CZOO L-12 Environmental Biology

UNIT- 1. General concepts

- 1.1 Introduction to environmental biology
- 1.2 Components of ecosystem
- 1.3 Major ecosystems in world
- 1.4 Energy flow in ecosystem
- 1.5 Food chain and food web
- 1.6 Bio- Geochemical cycle(C, N, and P)
 - 1.6.1 Water Cycle
 - 1.6.2 Gaseous Cycles- Carbon and Nitrogen
 - 1.6.3 Sedimentary Cycle- Phosphorous and sulphur

UNIT- 2. Population and communities

- 2.1 Population characteristics density, natality, mortality age pyramid and growth curve
- 2.2. Ecological succession and concept of climax

UNIT- 3. Pollution

- 3.1 Sources and impact of environmental pollutants- air, water and soil- Pollution Control
- 3.2 Global environmental changes- greenhouse gases and their effects
- 3.3 Acid Rains
- 3.4 Ozone Layer Depletion/destruction

UNIT- 4. Natural resources

- 4.1. Soil, water, mineral resources and their conservation
- 4.2. Biodiversity- benefits, hotspots, threats and conservation

Practical based on CZOOL-11 & CZOOL-12

CZOOL-11 Microbiology & Immunology

Credit - 2

CZOOL-12 Environmental Biology

Credit - 2

Microbiology (10 marks)

1. Preparation of liquid culture media of Bacteria.
2. Determination of microbial quality of milk.
3. Determination of microbial growth (spectrophotometric/colorimetric).
4. Study of microbiological laboratory safety and basic requirements.
5. Submission of report according to the syllabus.
6. Practical record and Viva-Voce.

Immunology (10 marks)

1. Determination of lymphoid organs.
2. Histological study of spleen, thymus and lymph nodes through slides/photographs.
3. Preparation of stained film to study various types of blood cells.
4. Demonstration of
 - a) ELISA
 - b) Immuno-electrophoresis
5. Submission of report according to the syllabus.
6. Practical record and Viva-Voce.

PRACTICAL BASED ON CZOO-12

ENVIRONMENTAL BIOLOGY (20 marks)

1. Determination of population density in a natural/hypothetical community by Quadrate method and calculation of Shannon-Weiner diversity Index for some community.
2. Study of aquatic ecosystem-(Temperature, turbidity, Determination of PH, phytoplankton and zooplankton).
3. Qualitative study of plankton in given water sample.
4. Study of Biological Water Quality Assessment (BWQA).
5. Quantitative study of plankton in given water sample.(total count and differential count)

Submission on report on a visit of National Park/Zoological park/Biodiversity park/Wildlife sanctuary. (10 marks)

Practical record and viva voce. (10 marks)

Recommended Books

Environmental Biology

1. Cunningham and Cunningham: Environmental Science (2003, McGraw Hill)
2. Odum: Fundamental of Ecology (1971, Saunders)
3. Raven, Berg and Jhonson: Environment (1993, Saunders)
4. Ricklefs: Ecology (1990, Freeman)
5. Sharma: Ecology and Environment (2003, Rastogi)
6. Turk and Turk: Environmental Science (1998, Saunders)

ZOOLOGY HONOURS

DSE-1 :- Economic Zoology

Credit-4(T) +2(P)

Teaching Hrs -60 (T)

Unit 1: Bee-keeping and Bee Economy (Apiculture)

- 1.1 social behaviors of insects.
- 1.2 genetic basis of social behavior
- 1.3 Other beneficial products from bee.
- 1.4 Diseases of honey bee,

Unit 2: Silk and Silk Production (Sericulture)

- 2.1 Different types of silk and silkworms in India;
- 2.2 life cycle of *Bombax mori* .
- 2.3 silk worm rearing technology
- 2.4 pathogens of silk worm diseases

Unit 3: Aquaculture

- 3.1 objective of fish culture: Qualities of cultivable species of fishes
- 3.2 Types of cultivable fishes, qualities of Major carps, breeding habits of cultivable fishes with special reference of major carps
- 3.3 fish culture programming.
- 3.4 factors in fish culture: physical factors, chemical factors and biological factors.
- 3.5 Induced breeding by hypophysation.
- 3.6 fishing methods in India. (fishing crafts and gears)

Recommended Books

1. Prost, P. J. (1962). *Apiculture*. Oxford and IBH, New Delhi.
2. Sericulture, *FAO Manual of Sericulture*.
3. Hafez, E. S. E. (1962). *Reproduction in Farm Animals*, Lea and Fabiger Publishers.
4. Srivastava, C. B. L. (1999). *Fishery Science and Indian Fisheries*. Kitab Mahal publications, India.
5. Sardar Singh, *Beekeeping in India*, Indian council of Agricultural Research, New Delhi.45
6. Dhyant Singh Bisht, *Apiculture*, ICAR Publication.
7. Knobil, E. and Neill, J. D. (2006). *The Physiology of Reproduction*, Vol. 2, Elsevier Publishers.
8. Dunham R. A. (2004). *Aquaculture and Fisheries Biotechnology - Genetic Approaches*. CABI publications, U.K.

DSE-2 :-Biostatistics

Credit-4(T) +2(P)

Teaching Hrs -60 (T)

UNIT-1 Data

- 1.1 Primary Data
- 1.2 Secondary data
- 1.3 Frequency distribution and tally marks

UNIT-2. Data presentation

- 2.1 Diagrammatic: Histogram and Pie Diagram
- 2.2 Graphical

UNIT-3. Measurement of central tendency

- 3.1. Mean
- 3.2 Median
- 3.3 Mode

UNIT-4. Measurement of Variation

- 4.1 Standard deviation
- 4.2 Standard error

UNIT-5. Test of Significance

- 5.1 Student 't' test

PRACTICAL BASED ON DSE :- 1 & DSE :- 2

1. Estimation of Do_2 or Dco_2 of pond Water. **(20 marks)**
2. Determination of Mean Median or Mode of given data sample. **(10 marks)**
3. Spotting **(2x5 = 10)**

Common carp, honey bee, Termites, silk worm, paddy pests sugar cane pests, fishing gears etc.

4. Field Report: Report on field Visit to sight of sericulture, Apiculture, Lac Culture and Aquaculture **(10)**

5. Practical record **(5 marks)**
6. Viva -voce **(5 marks).**

DSE-1 :- Economic Zoology

1. Report on field Visit to sight of sericulture, Apiculture, Lac Culture and Aquaculture
2. Study of Paddy pests, Pest of Sugar cane
3. Study of some economically Important fishes

DSE-2 :-Biostatistics

1. Determination of mean, median & mode
2. Determination of Deviation
3. Graphical representation of statistical data

**PROPOSED SYLLABUS FOR CHOICE BASED CREDIT SYSTEM
B.Sc Honours in Zoology
(Six Semester Course)
VIth SEMETER**

CZOO-13	Molecular Biology & Biotechnology	Credits 4 (T) +2 (P)
CZOO-14	Medical and Applied Zoology	Credits 4 (T) +2 (P)
DSE-3	Toxicology	Credits 4 (T) +2 (P)
DSE-4	Project	Credits 4 (T) +2 (P)

Semester VI

CZOOOL-13 Molecular Biology & Biotechnology

Credit 4 (T) +2 (P)

Teaching Hours 60 (T)+30(P)

UNIT-1. Nucleic Acids

- 1.1 Conformations of DNA(A, B and Z)
- 1.2 Mechanism of DNA replication
- 1.3 Mechanism of transcription in Prokaryotes
- 1.4 Mechanism of translation in prokaryotes

UNIT 2. Gene Regulation

- 2.1 Concepts of operon
- 2.3 Iac operon,
- 2.4 trp operon,

UNIT-3. Biotechnology

- 3.1. Tools: Restriction enzymes, Vectors
- 3.2. DNA fingerprinting
- 3.3. Concept and scope of Bio-technology
- 3.4. Animal cell culture (Basic Techniques)

CZ00L-14 Medical and Applied Zoology

Credit 4 (T) +2 (P)

Teaching Hours 60 (T)+30(P)

UNIT-1 Life Cycle, Pathogenicity , clinical features, prophylaxis and control of pathogenic protozoan

- 1.1 Plasmodium
- 1.2 Entamoeba histolytica
- 1.3 Leishmania donovani

UNIT-2 Pathogenic Helminthes parasites ,clinical Features ,Control and prophylaxis

- 2.1 Fasciola sp.
- 2.2. Wuchereria sp.
- 2.3. Ascaries sp.

UNIT-3 Vector Biology

- 3.1 Mosquito (Anopheles Female), Yellow Fever ,Dengue Fever,(Aedes)Filariasis (Culex Female) Japanese encephalitis
- 3.2 Plague

UNIT-4 Non Vector Diseases

- 4.1 Typhoid
- 4.2 Cholera
- 4.3 Small pox

UNIT-5 General Account of Vaccine & Vaccination, Eradication Programme, drug Therapy.

UNIT-6 COVID-19 (CORONA VIRUS)

- 6.1 Symptops, Epidemiology, Prevention and treatment.

Practical based on CZOOL-13 & CZOOL-14

Credit: 4

Practical hrs: 60

Molecular Biology & Biotechnology

1. Demonstration of DNA separation on Gel
2. Use of micropipette
3. Protein estimation by Colorimeter
4. Test of bio molecules : Carbohydrate, Protein and lipids

1. Physical examination of urine
2. Blood film preparation
3. Determination of Bleeding and clotting time
4. Glucose presence in Urine and serum
5. Slide / museum specimens of parasites
6. Study of specimens of common pests

Recommended Books

Molecular Biology & Biotechnology

1. B.D.Singh – A Text book of biotechnology

- 2.. Alberts *et al*: Molecular Biology of the Cell (2008, Garland)
3. Karp: Cell and Molecular Biology (2008, John Wiley)
4. Lodish *et al*: Molecular Cell Biology (2008, Freeman)

Immunology

1. Abbas *et al*: Cellular and Molecular Immunology (2001, Saunders)
2. Alberts *et al*: Molecular Biology of the Cell (5th ed. 2008, Garland)
3. Kuby: Immunology (2003, Freeman)
4. Roitt and Delvis: Roitt's Essential Immunology (6th ed. 2006, Blackwell)

Microbiology

1. Madigan and Martinko: Brock Biology of Microorganisms (2006, Prentice Hall)
2. Prescott, Harley and Klein: Microbiology (1999, McGraw)
3. Pelzar – Microbiology
4. Tortora *et.al* , Pearson 2011, 9th Edition

DSE-3:- Toxicology

(CREDITS: THEORY-4, PRACTICALS- 2)

THEORY

Teaching Hrs: 60

UNIT :- 1 Environmental Pollution :-

Air , water , soil and their control Strategies .

UNIT :- 2 . Environmental toxicology :-

Introduction , definition , classification , toxic agent (food additives ,pesticides , metals , carcinogens and poisons) , xenobiotics .

UNIT :- 3. Statistical method in toxicology , applications of toxicology (assessment of Lc 50, LD 50)

UNIT :- 4.

4.1.Environmental Impact assessment .

4.2. Environmental Policy .

UNIT :- 5. Animal Poisoning

5.1 Introduction, Honeybee, Scorpion and Snake poisoning

PRACTICAL BASED ON DSE :- 3

Credit: - 4

Practical hrs 30

DSE-3 PRACTICALS

1. To study the behavioural response of a fish under different dose of DDT in laboratory condition.
2. To determine LC50 of a toxicant like Cr, Cd, Mn and Ar for *Clarius batrachus* / *Labco rohita* under laboratory condition
3. Project report on food additives, pesticides, metals carcinogens and poisons.
4. Practical record /viva voce.

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DSE-4: - 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.

MARKS DISTRIBUTION

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

Instruction

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

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