

KOLHAN UNIVERSITY

CHAIBASA



UNIVERSITY DEPARTMENT OF ZOOLOGY, KOLHAN UNIVERSITY, CHAIBASA

COURSE CURRICULUM FOR POSTGRADUATE COURSES UNDER CHOICE BASED CREDIT SYSTEM

M.Sc .Zoology

WITH EFFECT FROM 2017

Dr. S.B.Lal [HOD]

CHAIRPERSON

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CBCS Post Graduate Program in Zoology 2017

Semester	Course Code	Name Of Paper	Credit	TOTAL CREDIT	Full Marks	ESUE*	SIA *(For Theory) /Viva - Voce (For Practical)	TOTAL
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ESUE :- End semester University Examination conducted by the Department / College .[FULL MARKS OF SIA :- 70]

SIA :- Sessional Internal Assessment conducted by the Department / College .[FULL MARKS OF SIA :- 30]

Semester - I

I	FC -001	COMPUTER FUNDAMENTALS	5	20	100	70	30	400
	CCZOO101	NON CHORDATE AND CHORDATE	5		100	70	30	
	CCZOO102	SYSTEMATICS , BIODIVERSITY , EVOLUTION	5		100	70	30	
	PZOO103	PRACTICAL BASED ON CZOO101 & CCZOO102	5		100	80	20	

Semester - II

II	EC -002	RESEARCH METHODOLOGY	5	20	100	70	30	400
	CCZOO104	IMMUNOLOGY, MOLECULAR BIOLOGY & COMPARATIVE ENDOCRINOLOGY	5		100	70	30	
	CCZOO105	MOLECULAR CELL BIOLOGY ,CELL STRUCTURE &FUNCTION	5		100	70	30	
	PZOO106	PRACTICAL BASED ON CCZOO104 & CCZOO105	5		100	80	20	

Semester - III

III	CCZOOOL 107	ANIMAL BHHAVIOR , BIOTECHNOLOGY , MICROBIOLOGY	5	20	100	70	30	400
	CCZOOOL 108	TOOLS & TECHINIQUES , BIOSTATISTICS AND	5		100	70	30	
	ECZOOOL 201A	GROUP- A :- FISH AND FISHERIES	5		100	70	30	
	ECZOOOL 201B	GROUP - B [ECOLOGY]BASIC ECOLOGY & HABITAT ECOLOGY & POPULATION ECOLOGY AND COMMUNITY ECOLOGY						
	EC(P)ZOOOL 202	PRACTICAL BASED ON ECZOOOL 201A OR 201B	5		100	80	20	

Semester - IV

IV	CZOOOL 109	REPRODUCTIVE PHYSIOLOGY, DEVELOPMENTAL BIOLOGY & GENETICS .	5	20	100	70	30	400
	ECZOOOL203A	GROUP - A : FISH AND FISHERIES	5		100	70	30	
	ECZOOOL203B	GROUP - B :[ECOLOGY] POLLUTION ECOLOGY & CONSERVATION AND MANAGEMENT						
	EC(P)ZOOOL 204	Practical based on ECZOOOL 203A OR 203B	5		100	80	20	
	PROJECT ZOOOL 205	Practical PROJECT	5		100	80	20	
Total			80					1600

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 (VeryGood)	7.5	75% to 79.99 %
B+(Good)	7	70% to 74.99 %
B(AboveAverage)	6	60% to 69.99 %
C(Average)	5	50% to 59.99 %
P(Pass)	4	45 % to 49.99 %
F(Fail)	0	Less than 45%
Ab(Absent)	0	

EXAMINATION FRAMEWORK FOR M.Sc

ESUE

- ❖ There will be a uniform pattern of question for all course and of all the programs .
- ❖ A total of **EIGHT** Question will be set in each course for the ESUE in which Question “1” will be Objective Type Question [MCQ /True - False /Fill in the Blanks , etc.] Consisting of “10” Questions of “1” marks each and will be COMPULSORY .
- ❖ Any **FOUR** Question shall have to be answered by the examinees out of the remaining **SEVEN** Question carrying “15” marks each .

SIA

- ❖ Written Examination :- **15 Marks**
- ❖ Co-curricular activities and Regularity :- **05 Marks**
- ❖ Project Work / Seasonal Work / Field Study :- **10 Marks**

[NOTE :- SIA :-Sessional Internal Assessment & ESUE :- End Semester University Examination]

PROPOSED SYLLABUS FOR CHOICE BASED CREDIT SYSTEM
M.Sc. In Zoology
(Four Semester Course)
1ST SEMETER

SEMESTER-I, CZOOL - 101 Non- Chordates & Chordates

UNIT - I :- NON - CHORDATES :-

1. Synopsis of Diversity of Non - chordate group
2. Protozoa :- Locomotion , Reproduction
3. Origin of Metazoa

4. Helminths :- Parasitic adaptation
5. Annelida :- Nephridia & celomic System
6. Arthropoda :- Respiration , Excretion
7. Mollusca :- Respiration .
8. Diagnostic Characters and Disstribution :-
Rotifera , Rhychozoela , Bryozoa , Brachiopoda , Pogonophora , Sipuncula , Echiura ,
Phoronida .

UNIT - II CHORDATES

1. Synopsis of Diversity of chordate groups .
2. Charateristic features and affinities of
 - Protochordata :- Hemichordata
Urochordata
Cephalochordata
3. Fishes :- Electric Organ and Electroreceptors
4. Amphibia :- Origin of Amphibia.
5. Reptiles :- Skull in Reptile, venom in Ophidians, Characteristic features and affinities of Sphenoden, Turtle.
6. Birds :- Parental Care in Birds, Nest building in birds .
7. Mammals :- Dentition, Aquatic Mammals .
8. Comparative anatomy :-
 - 8.1. Integument and its derivatives.
 - 8.2. Heart and kideny.

SEMESTER-I , CZOOL - 102

SYSTEMATICS , BIODIVERSITY , EVOLUTION

UNIT - I :- SYSTEMATICS & BIODIVERSITY

1. Basic concept of taxonomy and systematic - definition and role in biology
2. Biological classification -, Type of taxonomy , Linnaean concept and modern concept of Taxonomy .
3. School of Systematic :- Numerical phonetics, cladistics , Evolutionary systematic .
4. Concept of Biodiversity :- Definition , significance and Ecological role, Problems and scales of biodiversity Extinction .Biodiversity in bio geographical regions ,Diversity clines in relation to area , latitude , attitude and deep sea . Biodiversity indicators, surrogate species .

UNIT :-II :- EVOLUTION

1. Origin of life , Origin of cells and first organisms , evolution of eukaryotic cell from prokaryotes - a case of symbiosis .
2. Evidences of Evolution , Theories of evolution :- Lamarckism , Darwinism , Modern theories
3. Populations as a unit of Evolution :- Gene frequencies in , Mandelian population, Hardy - Weinberg equilibrium , Genetic drift.
4. Natural selection :- concept , types .
Isolating mechanisms
Concept of species,
Modes of speciation .
5. Patterns of Evolution :- Micro, Macro and Mega evolution .
6. Evolution of Man :- anatomical , geographical and cultural , Ancestry of Homo sapiens .
Evolution of Horse :- Phylogeny of history .

PZOOOL - 103 , PRACTICAL

PZOOOL -103, Practical Based on (CZOOOL-101 & CZOOOL-102)

ITEM	MARKS DISTRIBUTION
1. Dissection .	20
2. Spotting (10)	30
• Specimens	04
• Whole Mounts	02
• Sections	02
• Skull bones , Girdle , Limb Bones	02
3. Evolution	10
4. Ecology	10
5. Biodiversity	10
6. Practical Record	10
7. Viva Voce	10

PZOO - 103 , PRACTICAL DETAILS

- **Dissections :-**
 - ✓ General anatomy and nervous system of :- Leech , Prawn, Squilla , Scorpion , Unio , Pila , Sepia , Earthworm .
- **Specimen :-**
 - ✓ Study of Various living invertebrate phyla along with their larva .
- **Whole Mount :-**
 - ✓ Euglena , Amoeba , paramecium , Binnary Fission , Conjugation in Paramecium .
- **Section :-**
 - ✓ Invertebrates Species .
- **Evolution :-**
 - ✓ Study of Living Fossils .
 - ✓ Study of various connecting link [peripatus , amphioxus] .
- **Ecology :-**
 - ✓ Use of ecological equipments :- plankton Net , Sedgwick rafter , Sacchi disc , PH Meter , Centrifuge , thermometer .
 - ✓ Estimation of biological oxygen demand [BOD] & chemical oxygen demand [COD] .
 - ✓ Sampling and identification of freshwater planktons .
 - ✓ Community analysis : Estimation of relation density and relation and frequency by quadrate analysis .
- **Biodiversity :-**
 1. To Submit a Project report on any related topic of animal Biodiversity .

PROPOSED SYLLABUS FOR CHOICE BASED CREDIT SYSTEM
M.Sc. In Zoology
(Four Semester Course)
2nd SEMETER

M.Sc. ZOOLOGY

SEMESTER-II , CZOOL - 104
IMMUNOLOGY & COMPARATIVE ENDOCRINOLOGY

UNIT - I , IMMUNOLOGY

1. Vertebrate Immune System : Innate and specific /Acquired
 - 1.1 Innate Immune System : Composition , organization and structure of Lymphoid organs , cells of innate immune system and their functions , inflammation.
 - 1.2 Acquired immune system : B - cells (types and receptors) , T - cells (Types and receptors) , Antigen - Antibody interaction , Epitopes and haptens , Types , structure and functions of Antibodies , Antigen - presenting cells , Cell - Mediated and Humoral immunity.
2. MHC and their role , Self and Non - self discrimination.
3. Cytokines : Structure and function , Cytokine receptors
4. Hypersensitivity : - Type I , II , III , IV.
5. Regulation of Immune response .

UNIT - II , COMPARATIVE ENDOCRINOLOGY

1. Hormones : Classification , Mechanism of action of hormones (Receptor types and structure) second messenger System , cytosolic receptors and their action via gene expression .
2. Vertebrate endocrine glands and physiological role of their hormones : Adenohypophysis , Neurohypophysis, Urophysis , Thyroid , Parathyroid, corpus of stannous , Adrenal , Testes , Ovary , Placenta , Thymus , Kidney , Heart , Liver .
3. Endocrine Hypothalamus , its hormones and their physiological role
4. Pineal gland : Melatonin and photo-periodism, biological clock .
5. Endocrinology of calcium regulation ,
6. Comparative anatomy and physiological role of hormones of
 1. Pituitary complex
 2. Adrenal gland
 3. Thyroid gland .

SEMESTER-II , CZOOL - 105

UNIT :- I Molecular cell biology ,Cell structure & function

1. MOLECULAR ARCHITECTURE AND PROPERTIES OF DNA :

- 1.1 Stability and thermal denaturation
- 1.2 Physical properties
- 1.3 Types of DNA
- 1.4 Denaturation and renaturation of DNA.

2. DNA replication:

- 2.1 Enzymes and accessory proteins involved in replication
- 2.2 Mechanism of DNA replication in Prokaryotes and Eukaryotes.

3. Transcription and Post - transcriptional events :

- 3.1 RNA polymerases in Prokaryotes and Eukaryotes , Transcription factors.
- 3.2 Mechanism of transcription in Prokaryotes and Eukaryotes :- Assembly of pre-initiation complex and initiation , elongation and termination.
- 3.3 Post - transcription modifications in RNA : 5' - cap formation , 3' end processing and polyadenylation , RNA splicing , RNA editing , Post - transcriptional gene silencing (RNA interference) , Catalytic RNA and its role , Nuclear export of mRNA.

4. Translation

- 4.1 Prokaryotic and Eukaryotic translation : Mechanism of initiation , elongation and termination.
- 4.2 Post - translational modifications of proteins.

5. Regulation of Gene expression

- 5.1 Regulation of Gene expression in Prokaryotes : Operon concept , Inducible and repressible system , Positive and Negative control , Enhancers and silencers , Tryptophan - Operon , Lac - Operon ,
- 5.2 Regulation of Gene expression in Eukaryotes.

UNIT :- II CELL STRUCTURE AND FUNCTION

1. Cell membrane

1. 1 Structure :- Model cell membrane structure , lipid bilayer , Membrane proteins .

1. 2 Transport across cell membrane :- channels , carriers , pumps ,
mechanism of diffusion.

2. Sorting of Proteins

2. 1 Signal peptide and SRP –dependent targeting of translational complex

2. 2 Processing of proteins in RER

2. 3 Processing through Golgi complex, targeting to plasma membrane & Lysosome

2.4 Structure and biogenesis of Ribosomes

3. Nucleolus :- Structure and Function

4. Cytoskeleton :- Organization of Microtubules , microfilaments and Intermediate filaments ,role of cytoskeleton elements In cell shape , motility and cell division .

5. Cell signalling and Intercellular junctions

5. 1 Intercellular junctions , extracellular matrix , cell-cell adhesion, gap junction .

5. 2 Receptor classes :- Membrane receptors , Intracellular receptors

6. Cell Cycle :-

6. 1 Cell cycle and it's regulation :- role of cyclins and cdks . checkpoints in mammalian cell cycle .

6. 2 Apoptosis :- Mechanism and significance

PZOOOL - 106 , PRACTICAL
PZOOOL - 106 , Practical Based on (CZOOOL-104 & CZOOOL-105)

ITEM **MARKS DISTRIBUTION**

1. Dissection .	20
2. Spotting (10)	30
<ul style="list-style-type: none">• Endocrinology Slides• Developmental Biology Slides• Microbial Slides• Protochordates & Vertebrates Specimens• Bones (Skull bones , Girdle , Limbs bones)	02 02 02 02 02
3. Hematology	10
4. Cell Biology	10
5. Physiology & Biochemistry	10
6. Quantative Biology	05
7. Sessional Work	10
8. Viva - Voce	05

PZOOOL - 106 , PRACTICAL DETAILS

1. Dissection :-

- Afferent & efferent branchial vessels of bony fish.
- Accessory respiratory organ of air breathing fish .
- Neck nerves of mammals .

2. Hematology :-

- Preparation and study of various blood corpuscles of vertebrates .
- Determination of Hb % , ESR , TC DC , haematocrit value , PCV of blood of any vertebrate in normal and experimental condition .

3. Cell Biology :-

- Study of meiotic stages from temporary Acetocarmine aquash preparation of Grass Hopper Testis .
- Study of salivary gland polytene chromosomes from temporary acetocarmine aquash preparation .

4. Physiology & Biochemistry :-

- Measurement of arterial blood pressure in man with help of of sphygmomanometer by Auscultation method .
- Estimation of glucose , cholesterol , lipid in the serum of any mammals .

**PROPOSED SYLLABUS FOR CHOICE BASED CREDIT SYSTEM
M.Sc. In Zoology
(Four Semester Course)
3rd SEMETER**

M.Sc ZOOLOGY

SEMESTER-III, CZOOL - 107

ANIMAL BEHAVIOR, BIOTECHNOLOGY, MICROBIOLOGY

UNIT :- I , ANIMAL BEHAVIOR

1. Animal Behaviour :- Definition , objectives , significance . Patterns of behaviour :- Innate and Learned behaviour , concept of FAP, concept of Key or sign stimulus , innate releasing Mechanism , concept of Learning , imprinting , concept of evolution of behaviour .
2. Orientation in Animals :- Kinesis ,Types of Kinesis , Taxis Types of taxis Echolocation ,Language of honey bees .
3. Biological rhythms: - occurrence and significance , circadian , circannual , circatidan , circalunar , circasyzygie Clocks (with examples) .
4. Social behaviour in insects .

UNIT :- II MICROBIOLOGY .

1. Microbial nutrition , growth and control :-
 - 1.1.Micobial growth : Prokaryotic cell cycle, Growth curve, measurement of microbial growth , Influence of of Environmental factors on growth .
 - 1.2. Control of microbial growth : Pattern of microbial death, Use of physical methods and chemical agents In control .
2. Viruses :
 - 2.1. General characteristics of viruses, structure of Viruses , TMV, Bacteriophages
 - 2.2. Virus reproduction, cultivation of virus , virus purification and Assays .
 - 2.3. Viroids , virusoids, Prions
 - 2.4. Viruses and cancer
3. HIV : Structure , mode of infection, AIDS .
4. Common Antibiotics and their mode of action, vaccines ,
5. Applied and Industries microbiology :

UNIT : III :- BIOTECHNOLOGY

1. Basic steps in Gene cloning , Enzyme used for gene cloning .

2. Vectors :-

2.1 Definition , characteristics , types :- cloning and expression vectors.

2.2 Bacterial Plasmids as vectors , pBR322 , pUC , Cosmids , phagmids , Binary vectors ,BAC ,YAC ,MAC.

2.3 Selection of recombinants.

3. Gene Libraries

3.1 Genomic library and CDNA library : Construction and applications.

4. Methods' of introduction of cloned genes into host cells.

5. Applications of Biotechnology :

5.1 Preparation of Transgenic cell and animals : mechanism and applications.

5.2 Mechanism of production of Growth hormone , Insulin , Interferon's.

5.3 Mono clonal antibodies and Hybridoma technology

5.4 Gene therapy, Recombinant Vectors.

6. PCR : Mechanism and application

M.Sc ZOOLOGY

SEMESTER-III, CZOOL - 108

TOOLS & TECHNIQUES , BIOSTATISTICS

UNIT :- I, TOOLS AND TECHNIQUES :-

1. Microscopy : (Working Principle & methods of application)
 - 1.1 Fluorescence microscopy
 - 1.2 SEM
 - 1.3 TEM
2. Spectrophotometry
 - 1.1 Types of Spectrophotometer
 - 1.3 Absorption spectrum
3. Electrophoresis :
 - 3.1 Principle & applications.
 - 3.2 Agarose - and PAGE
4. Chromatography :-
 - 4.1 Principle & Applications
 - 4.2 Paper and thin layer chromatography
 - 4.3 Column chromatography :- Gel filtration , Ion exchange , Affinity chromatography
 - 4.4 HPLC
- Immunological Technique :-
5. NMR and X- RAY crystallography
 - 5.1. MRI , 5.2. RIA, ELISA
6. Centrifugation :-_ Basic principles, types , application

UNIT :- II ,BIOSTATISTICS

1. INTRODUCTION TO BIOSTATISTICS :- Population , sample variable , parameter , primary and secondary data , screening and representation of data , frequency distribution , bar diagram , histogram , pie diagram.
2. Mean , Median , Mode , standard deviation , Variance , Co - efficient of variation ANOVA (One - way and two - way).
3. Correlation and Regression
4. Hypothesis testing :- Non - parametric and parametric tests , χ^2 - test , t - test , F - test.

SEMESTER-III, Elective Course - 201A
[GROUP - A]
FISH AND FISHERIES

UNIT :- 1

A- EVOLUTION OF FISHES

- origin and evolution of fishes
- Classification of fishes up to order
- Evolution and phylogeny of fishes.

B SPECIAL ORGANS

- Fish osteology
- Acoustic- Lateralis system
- Accessory respiratory organs

C FISH PHYSIOLOGY

- Excretion and Osmoregulation in fishes
- Reproductive System – histology of ovary , ovarian cycle in teleosts
- Osmoregulation in fishes

D FISH ADAPTATION

- Migration – general accounts , migration behavior of some fishes, factor influencing fish migration and advantage of migration
- Deep sea and hill streams fishes
- Air bladder and weberian apparatus

UNIT :- 2

A - FISH CULTURE

- Physico-Chemical and biological factors in fishes
- Fish culture in fresh water fishes
- Fish culture programming

B- MARINE FISERIES OF INDIA

- Stratification of marine habitat, group of marine fisheries
- Coastal fisheries of India
- Fisheries of Bombay duck ,ribbon fish , pomfrets and Prawn

C- ESTUARINE FISHERIES

- Definition ,origin and classification
- Estuarine fisheries of Chilka Lake
- Prawn culture

D- RIVERINE FISHERY OF INDIA

- Fisheries of Ganga river system
- Dams and their effects on fish migration

M.Sc ZOOLOGY

**ECZOOOL - 202A, PRACTICAL ,
ECZOOOL - 202 , Practical Based on (PAPER - ECZOOOL -201A)
[GROUP - A]**

ITEMS	MARKS
1. Dissection	20
2. Taxonomic Description	10
3. Spotting (10 spots)	30
3 Slides	
2 Bones	
3 Fishes (food fishes ,ornamental ,larvicidal , exotic fishes and Fishes with adaptive features)	
1 Fishing / ecological equipments	
1 Plankton / aquatic weeds or plants	
4. Adaptation / plankton	05
5. Genetics	10
6. viva - voce	10
7. Records and Sessional Work	15

PZOOOL - 202A , PRACTICAL DETAILS

1. Dissection :-

- > general anatomy , Cranial nerves, Afferent and efferent blood vessels of fishes.
- > Digestive system of herbivore and carnivore fishes

2. Taxonomic Description :-

- > taxonomic identification up to species of important fresh water and marine fishes

3. Adaptation / plankton :-

- > Collection identification of aquatic plants , weeds & plankton .

4. Genetics :-

- > Localization of RNA / DNA in prefixed tissue by didderent staining . e.g methyl green - pyronin Y .
- > Fuelgens reaction to locate DNA .
- > Quantative estimation of DNA and RNA is biological . Sample by Spectrophotometer .
- > C- banding , NOR - banding , sister chromatid exchanges in bone marrow chromosome preparation .
- > Drosophila or chironomus larva salivary gland chromosomes .

SEMESTER-III, Elective Course - 201B

[GROUP - B] , ECOLOGY

BASIC ECOLOGY & HABITAT ECOLOGY & POPULATION ECOLOGY AND COMMUNITY ECOLOGY

UNIT - I, BASIC ECOLOGY & HABITAT ECOLOGY

1 : Basic Ecology

- 1.1. Productivity : primary ,secondary and tertiary .
- 1.2. ecological niche : niche overlap and niche breadth ,niche segregation.

2 : Fresh water Ecology

- 2.1. Origin and classification of lakes .
- 2.2. Physic - chemical and biological (plankton and Benthos) characteristics of lakes .

3 : Terrestrial Ecology

- 3.1. Characteristics of desert and forest biomass (with particular reference to india).
- 3.2. Adaptation of desert animals .

UNIT - II

POPULATION ECOLOGY AND COMMUNITY ECOLOGY

4. Population Growth

- 4.1. Exponential
- 4.2. Sigmoid
- 4.3. Stochastic model for growth .

5. Population interaction

- 5.1. Competition - types ,intra & inter specific competition , Competitive ability .
- 5.2. Lotka - volterra models for competing species .
- 5.3. Predation - predatory response , co evolution of prey predator system one prey one predator model .

6. Natural regulation of population

- 6.1. Theories
- 6.2. Role of density dependent and density independent factors .
- 6.3. Model for population regulation

7. Community Ecology

- 7.1. Community structure
- 7.2. Concept of ecological dominance .
- 7.3. Concept of species diversity .
- 7.4. Ecotype and ecotone , concept of climax .

**ECZOOOL - 202B, PRACTICAL ,
ECZOOOL - 202B , Practical Based on (PAPER - ECZOOOL -201B)
[GROUP - B]**

ITEMS	MARKS DISTRIBUTION
1. Water Analysis	20
2. Biotic Analysis	15
3. Bio Statistical Analyis	15
4. Adaptation study Spotting [5x4]	20
5. Record and Sessional Work	20
6. Viva - Voce	10

M.Sc ZOOLOGY

ECZOOOL - 202B, PRACTICAL DETAILS

1. WATER ANALYSIS :-

- Estimation of carbonate , and Dissolved O_2 & CO_2 in sample water .
- Estimation of chloride in sample water .
- Estimation of hardness & OMC of Sample water .
- Estimation of Magnesium and calcium in sample water

2. BIOTIC ANALYSIS :-

- Qualitative , Quantitative assessment and working of indices of diversity and dominance of :-
 - ✓ Plankton .

3. BIOSTATISTICAL ANALYSIS :-

- Analysis of correlation coefficient and simple linear regression in set of data .
- Analysis of similarity index in the species composition by 2x2 contingency table in a forest system .

4. ECOLOGICAL ADAPTATION STUDY :-

- Aquatic insect , Terrestrial insects .
- Higher Vertebrates .
- Ecological Equipments .
- Ecological significances of earthworm .
- Identification of Aquatic plants and weeds .

**PROPOSED SYLLABUS FOR CHOICE
BASED CREDIT SYSTEM
M.SC. IN ZOOLOGY
(FOUR SEMESTER COURSE)
4TH SEMETER**

SEMESTER-IV, CZOOL - 109

REPRODUCTIVE PHYSIOLOGY , DEVELOPMENTAL BIOLOGY & GENETICS .

UNIT :- I , REPRODUCTIVE PHYSIOLOGY , DEVELOPMENTAL BIOLOGY.

1. Sperm maturation in Male reproductive tract , role of testicular hormones , capacitation in female reproductive tract.
2. Bizarre phenomena in mammalian reproduction : Bruce effect , Lee boot effect , Whitten effect.
3. Uterine cycles : - Estrus and menstrual cycle , hormonal regulation of uterine cycles
4. Implantation , Delayed implantation , sterility due to hormonal defects , IVF , Super Ovulation , Variations in IVF.
5. Early Embryonic development :
 - 6.1 cleavage and blastulation , characteristics of cleavage , physiology of cleavage.
 - 6.2 Fate maps and cell linkage
 - 6.3 Gastrulation , morphogenetic movements , Neurulation : neurogenesis , notogenesis and mesogenesis, Morphogenesis.
6. Differentiation: Cell commitment , determination and cyto differentiation , molecular biology of differentiation , control , levels of differentiation , tissue maintenance and replacement.
7. Blastogenesis , Regeneration (Morphallaxis and Epimorphosis) , Regeneration of amphibian limb and lens.
8. Metamorphosis : Hormonal regulation of amphibian metamorphosis.
9. Stem cells and their applications.

UNIT :- II , GENETICS .

1. Mendel's laws and their chromosomal basis , Extension of Mendelism : Epistasis , Pleiotropy , multiple allelism , Linkage.
2. Gene mutation and DNA repair :
 - 2.1 Types of gene mutations.
 - 2.2 Methods for detection of induced mutations.
 - 2.3 P - element insertional mutagenesis in Drosophila
 - 2.4 DNA damage and repair
3. Methods of gene mapping :
 - 3.1 3 - point test cross in Drosophila
 - 3.2 Gene mapping in human by linkage analysis in pedigrees.
 - 3.3 Tetrad analysis in Neurospora
 - 3.4 Gene mapping in bacteria by conjugation , transformation and transduction.
4. Organization and function of mitochondrial DNA :

**SEMESTER-IV , Elective Course - 203A
[GROUP - A]**

FISH AND FISHERIES

UNIT :- 1

A- AQUATIC WEEDS AND AQUATIC POLLUTION

- Introduction and classification of aquatic weeds .
- Common aquatic weeds and control measures

B- FISH PRESERVATION

- Method of fish preservation
- Reasons for spoilage of fishes
- Fish By-Product

C- SEWAGE FEED FISHERIES

- Definition Sewage ,general account,and quality of sewage
- Treatment of sewage, principle cultivation fishes
- Production of sewage fish culture

D- INDUCE BREEDING

- Bundh breeding, types of Bundhs
- Induced Breeding by Hypophysaton
- Factors influencing induced breeding

UNIT 2

A- FISH PATHOLOGY AND CURE

- Nutritional Diseases
- Intrinsic diseases
- diseases caused by pathogens and parasites and their treatment

B-SPECIALIZED ORGANS IN FISHES

- Light producing organs
- Electric organs in fishes
- Sound producing organs
- Poison glands in fishes

C-ENDOCRINE GLANDS

- Pituitary gland or hypophysis
- Corpuscles of Stannius
- Ultimobranchial Glands

E- FISHING GEARS

- Local fish catching device
- Conventional inland and marine fishing gears
- Modern fish catching device and techniques

ECZOOOL - 204A, PRACTICAL
Practical Based on (PAPER - ECZOOOL -203A)
[GROUP - A]

ITEMS	MARKS
1. Microtomy	20
2. Spotting (10 spots)	30
3 Sildes from fish Endocrinology . 3 slides from developmental biology . 1 specimen showing animal behaviour. 2 slides from Reproductive system . 1 Microbial silde .	
3. Reproductive Techniques	10
4. Immunology	10
5. Sessional Work	20
6. viva - voce	10

ECZOOOL - 204A, PRACTICAL DETAILS

1. Microtomy:-

- Study of the histological and histochemical slides of different organs of vertebrates .
- Fixative , staining and preparation of histological & endocrinological slides of different organs of fish .

2. Reproductive Techniques :-

- Collection of mammalian blastocyst .
- Ovariectomy /orchidectomy in mice/rat .
- Dating of uterine cycle in vaginal smears of any mammal .

3. Immunology :-

- Blood film preparation and identification of cells .
- Antigen antibody interaction in vitro .
- Histology of lymphoid organs .
- Immunological diagnosis of pregnancy by ELISA .

**SEMESTER-IV , Elective Course - 203B
[GROUP - B] , ECOLOGY
POLLUTION ECOLOGY & CONSERVATION AND MANAGEMENT**

UNIT - I , POLLUTION ECOLOGY

1. Water Pollution .

- 1.1. Types and source pollutants and their effect .
- 1.2. Eutrophication .
- 1.3. Biodegradable and non - degradable pollutants .
- 1.4. Bio - indicators of pollution .

2. Air pollution

- 2.1. Sources and effect of air pollutants
- 2.2. Aerosol , Smog .
- 2.3. Green house effect
- 2.4. Ozone depletion.
- 2.5. Acid rain

3. Eco-toxicology

- 3.1. Effect of agriculture waste , heavy metals , organic wastes and industrial wastes on aquatic organisms.
- 3.2. Biomagnifications

UNIT - II , CONSERVATION AND MANAGEMENT

4. Conservation & Biodiversity

- 4.1. Concept of conservation
- 4.2. conservation of natural resources & their importance .
- 4.3. Concept of biodiversity .
- 4.4. Causes of biodiversity depletion .
- 4.5. Hot spots and mega biodiversity zones .
- 4.6. Priority fixation of biodiversity conservation.

5. Resource management

- 5.1. Concept of natural resources.
- 5.2. Management of air & water resources.

6. Wildlife and forest Management

- 6.1. Concept of endangered , Critically endangered species , endangered species , Valnerable & Rare Species.
- 6.2. Importance of wild life and causes of Extinction .
- 6.3. Biological basis of wild life management .

7. Environmental biotechnology

- 7.1. Concept of bioremediation and its application.
- 7.2. Solid waste management: both organic and inorganic.

ECZOOOL - 204B, PRACTICAL
Practical Based on (PAPER - ECZOOOL -203B)

ITEMS	MARKS DISTRIBUTION
1. Soil Analysis	20
2. Biotic Analysis	15
3. Bio Statistical Analysis	15
4. Adaptation study Spotting [5x4]	20
5. Record and Sessional Work	20
6. Viva - Voce	10

M.Sc ZOOLOGY

ECZOO - 204B, PRACTICAL DETAIL

1. SOIL ANALYSIS :-

- Estimation of OMC / Total carbon of soil sample .
- Estimation of CaCO_3 in a soil sample .
- Estimation of soil respiration rate in a sample .
- Estimation of N,P,K, in a soil sample .
- Oxycolorific value of leaf of a plant in a chosen system.

2. BIOTIC ANALYSIS :-

- Qualitative , Quantitative assessment and working of indices of diversity and dominance of :-
 - ✓ Benthos .
 - ✓ Soil fauna.

3. BIOSTATISTICAL ANALYSIS :-

- Analysis of standard deviation and standard error in a set of data .
- Species area curve for sampling of population by quadrat method.

4. ECOLOGICAL ADAPTATION STUDY :-

- Fresh water fish [hill stream fish]
- Marine fish .
- Ecological Equipments (use of pH meter, water bath , centrifuge , colorimeter, thermometer) .
- Ecological significances of plants .
- Identification of Bio indicator Species .

SEMESTER-IV, PROJECT WORK
PZOOL - 110

Practical hrs :- 30

Project work

The objective of this paper is to inculcate the trait of independent investigation , the student shall work (approximately 60 to 75 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 /Research institutes recognized by Kolhan University.

Two examiners shall evaluate the project. a written test one hour duration relating to the project shall be taken .

MARKS DISTRIBUTION

❖ Project Preparation through Power Point	40
❖ Written Test	40
❖ Viva - Voce	20

SEMESTER - I

FC-001 :- COMPUTER FUNDAMENTALS

UNIT - I

- Evolution of Computers - Generation , Types of Computer , Computer system Characteristics ,
- Basic Components of a Digital Computer - Control Unit , ALU , Input /out put functions and memory , memory addressing capability of a CPU , World length of a Computer , Processing Speed of a Computer , Computer Classification .

UNIT - II

- Input / output Units :- Keyboard , Mouse ,Trackball , Joystick , Digitizing tablet , Scanners , Digital Camera , MICR ,OCR , OMR , Bar- code Reader , Voice Recognition , Light pen , Touch screen .
- Monitors & types of Monitors - digital , analog , size resolution , refresh Rate , Dot pitch , Video standard - VGA , SVGA ,XGA etc .
- Printers & types - Daisy wheel , Dot Matrix , inkjet , laser , LinePrinter , Plotter , Sound Card and Speakers .

UNIT - III

- Memory - RAM ,ROM , EPROM , PROM and other types of memory .
- Storage fundamentals - primary vs. Secondary data storage .
- Various storage Devices - Magnetic Tape , Magnetic Disks , Cartridge Tape , Hard Disk Drivers, Floppy Disks (Winchester Disk), Optical Disks , CD, VCD, CD-R,CD-RW, Zip Drive , flash drives ,video Disk , Blue Ray Disc , SD/ NNC Memory cards , physical structure of floppy & hard disk , drive naming conventions in PC .

UNIT - IV

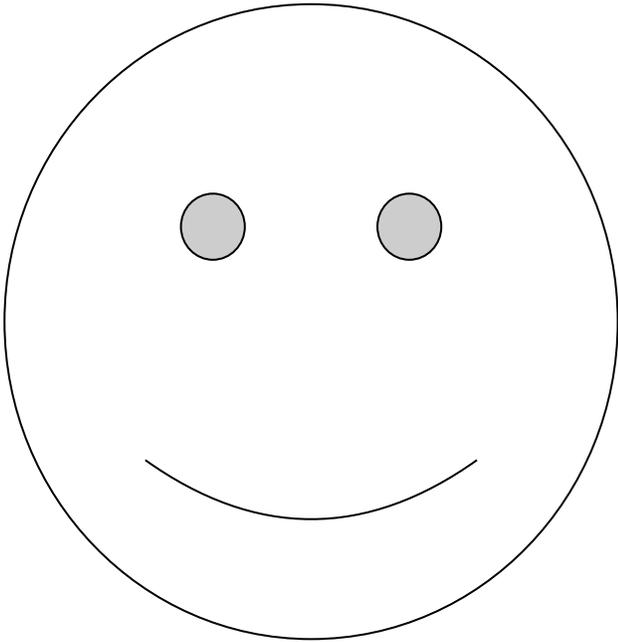
- Software and its need.
- Types of Software - System software , Application Software .
- System Software -Operating System , Utility Program ,Algorithms,
- Flow charts - Symbols , rules for making Flow chart , programming languages , Assemblers , Compilers and interpreter , Computer Application in Business .

UNIT - V

- Introduction to internet ,Connecting to the internet hardware ,Software & ISPs , search Engines , web portals , online shopping .
- Email - Types of email , Compose and send a message . Reply to a message , working with emails .

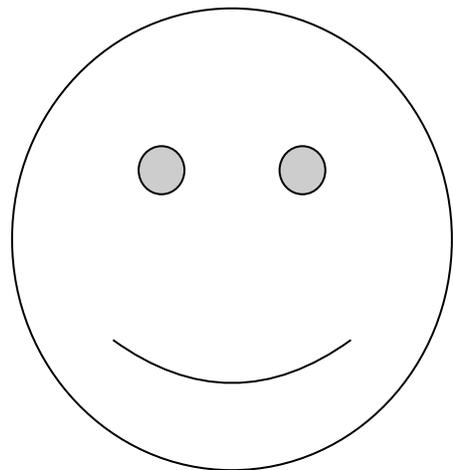
SEMESTER - II
FC-002 :- RESEARCH METHODOLOGY

Unit No	Topics
01.	Introduction to Research :- Meaning , Characteristics , Objectives and Importance of research , Motivation and Objectives- Research methods Vs Methodology.Types and methods of research - Descripiive Vs Analytical , Applied Vs Fundamental , Quantitative V.s Qualitative , Conceptual Vs Empirical .
02.	Research Formulation :- Defining and Formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem -Literature review - Primary and Secondary sources - reviews , treatise , monographs - patents -web as a source - searching the web - Critical literature review - Identification gap areas from literature review - Development of working hypothesis .
03.	Research Design :- Concept and Importance in Research - Features of a good research design - Exploratory Research Design - concept , types and uses , Descriptive Research Designs - concept , types and uses . Experimental Design :- Concept of Independent & Dependent variables .
04.	Data Collection and analysis :- Execution of the research - Observation and Collection of Data - Methods of data collection - Sampling Methods - Data processing and analysis strategies - Data Analysis with statistical packages - Hypothesis - testing - Generalization and Interpretation.
05.	Research Report :- Types of research reports - Brief reports and Detailed reports ; Reports Writing : Structure of research report - Preliminary selection , Main report , Interpretations of results and suggested Recommendations , Report Writing : Formulation rules for writing the report : Guidelines for presenting tabular data , Guidelines for Visual Representations , Illustrations and tables - Bibliography , referencing and footnotes .



END

THANK...U



M.Sc ZOOLOGY