KALINGA UNIVERSITY

SCHEME OF EXAMINATION
&
DETAILED SYLLABUS
For

M.Sc Zoology
(Semester Mode)

(w.e.f. 2019-20)

Department of Zoology
Kalinga University
New Raipur, Chhattisgarh

Kalinga University, Raipur
M.Sc. Zoology
w.e.f 2019-20 session

	First Semester				
Code No.	**Paper**	**Credits**	**Theory Marks**	**Internal Marks**	**Total Marks**
MZOO101	**BIOSYSTEMIC AND TAXONOMY**	4	70	30	100
MZOO102	**STRUCTURE & FUNCTION OF INVERTEBRATES**	4	70	30	100
MZOO103	**CELL AND MOLECULAR BIOLOGY**	4	70	30	100
MZOO104	**BIOCHEMISTRY AND ENDOCRINOLOGY**	4	70	30	100
MZOO105P	Lab Course-I	3	30	20	50
MZOO106P	Lab Course-II	3	30	20	50
	Total	**22**	**340**	**160**	**500**
	Second Semester				
Code No.	**Paper**	**Credits**	**Theory Marks**	**Internal Marks**	**Practical Marks**
MZOO201	**EVOLUTION AND BIOSTATISTIC**	4	70	30	100
MZOO202	**ECOLOGY, ENVIRONMENT AND POPULATION**	4	70	30	100
MZOO203	COMARATIVE ANATOMY OF VERTEBRATE	4	70	30	100
MZOO204	**ANIMAL PHYSIOLOGY**	4	70	30	100
MZOO205P	Lab Course-I	2	30	20	50
MZOO206P	Lab Course-II	2	30	20	50
	Total	**20**	**340**	**160**	**500**
	Third Semester				
Code No.	**Paper**	**Credits**	**Theory Marks**	**Internal Marks**	**Total Marks**
MZOO301	**GENETICS**	4	70	30	100
MZOO302	**TOOLS AND TECHNIQUES IN BIOLOGY**	4	70	30	100
MZOO303	**DEVELOPMENTAL BIOLOGY**	4	70	30	100
MZOO304	**IMMUNOLOGY & DIESASES**	4	70	30	100
MZOO305P	Lab Course-I	2.5	30	20	50
MZOO306P	Lab Course-II	2.5	30	20	50
	Total	**21**	**340**	**160**	**500**
	Fourth Semester				
* Student has to select any three papers of their choice					
Code No.	**Paper**	**Credits**	**Theory Marks**	**Internal Marks**	**Practical Marks**
	Elective (Any Three)				
MZOO401*	**Animal Behaviour**	4	70	30	100
MZOO402*	**Wildlife and Conservation Biology**	4	70	30	100
MZOO403*	**Ichthyology (Fish) Structure and Function**	4	70	30	100
MZOO404*	**Pisci Culture and Economic Importance of Fishes (Ichthyology)**	4	70	30	100
MZOO405	**Dissertation Presentation & Viva-voice**	6	100	50	150
MZOO406P	Lab Course	3	30	20	50
	Total	**25**	**340**	**160**	**500**

M. Sc. ZOOLOGY SEMESTER - I

MZOO 101: BIOSYSTEMIC AND TAXONOMY

Unit – 1

1. Definition, basic concept of biosystemics.
2. Definition, basic concept of Taxonomy
3. Trends in biosystematics : Chemotaxonomy, cytotaxonomy and molecular taxonomy
4. Different types of taxonomic characters and types

Unit – II

1. Taxonomic Characters and different kinds.
2. Taxonomic procedures-
    a. Taxonomic collections
    b. Taxonomic preservations
    c. Taxonomic curating

Unit –III

1. Species concepts: species category, different species concepts, subspecies and other infraspecific categories
2. Mechanism of speciation
3. Theories of biological classification: hierarchy of categories.
4. Concepts of panmatic and apomictic species

Unit – IV

1. Concepts of taxonomic keys
2. Different kinds of taxonomic keys
3. Merits and demerits of taxonomic keys
4. Process of typification and different Zoological types

Unit- V

1. International code of Zoological nomenclature (ICZN)
2. Evaluation of biodiversity indices.
3. Evaluation of Shannon Weiner Index.
4. Evaluation of Dominance Index.

MZOO 102 : STRUCTURE & FUNCTION OF INVERTEBRATES

UNIT-I

1. Brief knowledge of invertebrate characters & classification upto orders.
2. Organization of coelom
3. General account of locomotion in protozoa
4. Protozoan & human diseases

UNIT II

1. Cellular organization, skeleton & canal system of Porifera
2. Polymorphism in coelenterate
3. Mesenteries in coelenterate
4. General organization & life cycle of Fasiola& Ascaris

UNIT-III

1. Origin of coelom & metamerism in Annelida
2. Segmental organs of Annelida
3. Parasitic adaptation of leech
4. Mouth parts & appendages of Arthropoda.

UNIT-IV

1. Torsion in Gastropoda
2. Brief knowledge of foot & nervous system of Mollusca
3. Water vascular system of Echinodermata
4. Larval forms of Echinodermata.

UNIT-V

1. Affinities of Balanoglossus
2. Characters & classification of Protochordata
3. General account of Herdmania
4. General account of Amphioxus

MZOO 103: CELL AND MOLECULAR BIOLOGY

Unit - I

1. Cell membrane
2. Transport of biomolecules across the membrane
3. Structure and function of cell organelle
4. Nucleus

Unit – II

1. Cytoskeleton : Cilia and flagella
2. Structure of microfilament
3. cell cycle and Check point
4. Mechanism and regulation of Apoptosis

Unit- III

1. Protein structure type and function
2. Protein synthesis
3. Enzyme : Structure and classification
4. Enzyme function

Unit- IV

1. Nucleotide, nucleic acid
2. Chromosome : structure and function
3. DNA Structure and type
4. Nucleosome structure and function

Unit –V

1. DNA Metabolism
2. RNA metabolism
3. DNA Fingerprinting
4. Replication of DNA

MZOO 104 : BIOCHEMISTRY AND ENDOCRINOLOGY

Unit -1

1. Structure of carbohydrate
2. Classification of Carbohydrate
3. Carbohydrate synthesis
4. Carbohydrate metabolism

Unit – II

1. Structure of lipid
2. Classification of lipid
3. Lipid biosynthesis
4. Lipid metabolism

Unit – III

1. Structure of Vitamins
2. Classification of vitamins
3. Functions of vitamins
4. Amino Acid Basic structure, types and function.

Unit –IV

1. Structure classification and function of endocrine gland.
2. Thyroid and Parathyroid gland
3. Hypothalamus and Pituitary gland
4. Adrenal gland

Unit – V

1. Hormone Classification
2. Action mechanism of hormone
3. Gonadal cycle
4. Endocrine diseases

MZOO 105P:

PRACTICAL LIST OF BIOSYSTEMIC AND TAXONOMY &STRUCTURE AND FUNCTION OF INVERTEBRATES (Paper I & Paper II):

1. Identification, classification and study of distinguishing features of important representatives from various groups (Protozoa to Hemichordata).
2. Study of biodiversity among various invertebrates and vertebrates (Listing of all the animals found in and around your house and also try to find out their Zoological names).
3. Visits to a local animal park or zoo to identify and study the captive fauna and preparation of report.
4. Taxonomic key formation and conversion.
5. Study of biodiversity in grassland and pond water by using Shannon -Weiner index
6. To study the different characters and classification of Invertebrate specimens
7. Dissection; Reproductive, Excretory, nervous and systems of leech.
8. Dissection Mouth parts and reproductive system of cockroach;
9. Study of sections of the arm of a starfish;
10. Collection of various insect species.

MZOO 106P:

PRACTICAL LIST OF CELL AND MOLECULAR BIOLOGY & BIOCHEMISTRY AND ENDOCRINOLOGY (Paper III& Paper IV):

1. Isolation of DNA/RNA
2. Study of mitochondria from buccal epithelium by staining with supravital stains.
3. Culture of amoeba, paramecium, euglena.
4. Study of cell division mitosis/meiosis by squash and smear preparation of root tip and cockroach/ grasshopper testis.
5. Study of giant chromosome in the salivary gland of Chironomous larvae or Drosophila.
6. Study of Barr body and human chromosome.
7. Culture and study of drosophila.
8. Estimation of RBC, haemoglobin, hematocrit/PVC,
9. Estimation of blood group, Rh factor and blood clotting time.
10. Determine the blood pressure of man.
11. Demonstration of osmosis.
12. Study of histology of endocrine glands in different animal types through permanent slides and microtomy.

M. Sc. ZOOLOGY SEMESTER - II

MZOO 201: EVOLUTION AND BIOSTATISTIC

Unit –I

1. Organic Evolution
2. origin of life
3. Origin of earth Vs origin of life
4. Evidences of organic evolution

Unit-II

1. Evidences from Taxonomy
2. Evidences from palaeontology
3. Evolution from Genetics
4. Fossils and time scale

Unit- III

1. Evolution of man
2. Micro and Macroevolution
3. Variation
4. Theories of evolution (Lamarckism, Darwinism)

Unit- IV

1. Speciation & Isolation
2. Research methodology (Graphic representation of the data.)
3. Measurement of Central tendency (Mean, mode, median dispersion, Test of significance – Standard error, standard deviation)
4. ANOVA

Unit-V

1. t-test and Chi square-test , Z test
2. Sampling theory
3. Correlation &regression
4. Basic Computer knowledge (MS Office, MS word, MS excel, PPT)

Books : Evolution Biology - Basis of Biostatics (Jatinder bali, Anil Kant) Fundamental of Biostatistics by – Satguru Prasad Emkay Publication Delhi

MZOO 202 : ECOLOGY, ENVIRONMENT AND POPULATION

Unit-I

1. Ecosystem and their component (Biotic and Abiotic)
2. Various types of ecological pyramids
3. Food web and food chains
4. Lotic and lentic systems

Unit-II.

1. Ecological succession (Xerosere, Hydrosere and Lithosere)
2. Niche Hypothesis (Realised and fundamental Niche)
3. Ecosystem Energetics (NPP, GPP, TPP)
4. Resilience of ecosystem, Community stability and disturbance

Unit- III

1. Species interaction (Natural selection)
2. Interspecific interaction (Commensalism, mutualism, competition and predation)
3. Bio-magnification and Eutrophication processes
4. Biogeochemical cycle

Unit- IV

1. Concept and principles of Diversity
2. Biodiversity and wildlife conservation methods
3. Sustainable Development and Natural Resource management
4. National legislation for protection of biological resources

Unit-V

1. Demography (Mortality, fecundity and age structure)
2. Population growth (Exponential and logistics)
3. Life history strategies – r and k selection.
4. Metapopulation dynamics

MZOO 203 : COMARATIVE ANATOMY OF VERTEBRATE

UNIT-I

1. Origin of Chordates
2. Classification of Vertebrates (Fish, Amphibians, Reptiles, Birds and Mammals)
3. General structure and functions of Integument
4. Vertebrate integument and its derivatives
5. Dermal derivatives of skin (Horn, Hoofs and feathers)

UNIT II

Comparative account of skeletal system:

1. Suspensoria or Jaw suspension
2. Skeletal system: Vertebral Column
3. Skeletal system: Girdles
4. Skeletal system: Limb bones

UNIT-III

Comparative account of circulatory system:

1. Evolution of Heart.
2. Evolution of aortic arches
3. Detailed account of arterial system.
4. Detailed account of venous system.

UNIT-IV

Comparative account of nervous system

1. Brain
2. Central Nervous system
3. Peripheral Nervous system
4. Brief account of neurons and nerve impulse transmission.

UNIT-V

Comparative account of urogenital system:

1. Evolution of nephrons
2. Reproductive system male.
3. Female Reproductive system.
4. Excretory organ vertebrate(with detailed description of mammalian kidney)

MZOO 204 : ANIMAL PHYSIOLOGY

UNIT-I
Physiology of Digestion
1. Organisation of digestive system.
2. Secretion of various parts of Gastro intestine .
3. Digestion of carbohydrate, lipid & proteins.
4. Absorption of carbohydrate, lipid & proteins.

UNIT-II
Physiology of Respiration:
1. Respiration
2. Oxygen gaseous exchange.
3.Carbon dioxide gaseous exchange
4. Respiratory Pigment

UNIT-III
Physiology of excretion.
1. Excretion
2. Structure of kidney.
3. Physiology of excretion.
4. Osmoregulation

UNIT-IV
Receptor Organ & nerve physiology.
1. Photoreceptors , Bioluminescence.
2. Auditory Receptor & Chemoreceptor.
3. Synaptic Transmission
4. Propagation of nerve impulse.

SUGGESTED READINGS MATERIALS

• Animal Physiology & Biochemistry(R.A. Agarwal)
• Foundation Of Embryology- Bradley M. Patten, McGrow Publication
• Fertilization In Animals- Brain Dale, ArlondHeiniman, Gulab Vazerani Publication
• Development Biology - N.J. Berril, Tata McGraw Hill Publication N. Delhi
• Embryology Of Vertebrates – Nelson

MZOO205P:

LAB COURSE-I: PRACTICAL BASED ONEVOLUTION AND BIOSTATISTIC&ECOLOGY, ENVIRONMENT AND POPULATION ECOLOGY

1. Preparation of frequency tables and graphs.
2. Calculation of standard deviation, variance and standard error of mean.
3. Calculation of probability and significance between means using t-test, Chi-square test, ANOVA.
4. Calculation of correlation, regression and probability distribution.
5. Computer software use for computational tasks& data presentation.
6. Identification, classification and study of distinguishing features of museum specimens and slides(Protochordates and Chordates).
7. Comparative studies of integumentary,skeleton and reproductive system of major vertebrateclasses.
8. Dissections by using alternate methods like clay modelling: fowl/scoliodon cranial nerves.

MZOO 206P:

LAB COURSE-II:PRACTICAL BASED ON PAPER COMARATIVE ANATOMY OF VERTEBRATE& ANIMAL PHYSIOLOGY

1. Study of museum specimen and histological slides of chordates.
2. Osteology of vertebral column, girdles and limb bones of fish, aves& mammals.
3. Demonstration of cranial nerves system of scoliodon.
4. Slides of chick embryology.
5. R.B.Cs & W.B.Cs. count in human blood
6. Hb percentage in human blood
7. Study of retrogressive metamorphosis.
8. Study of sex determination of drosophila.
9. Study of endocrine diseases

M. Sc. ZOOLOGY SEMESTER - III

MZOO 301 : GENETICS

UNIT-I

1. Hereditary and variation.
2. Source of hereditary & variation .
3. Scope and significance of genetics
4. Genotype and Phenotype concept.

UNIT-

1.Mendel principal
2.Genetic code
3Crossing over
4 Identification of genetic material

UNIT-III

1 Chromosomes
2 The chromosome theory of inheritance
3 Structural changes in chromosomes
4 Numerical changes in chromosomes

UNIT-IV

1 Sex determination(Mammalian & Drosophila)
2 Sex differentiation
3 Sex linked inheritance (Haemophilia, colour blindness)
4 Linkage Theory

UNIT-V

1 Mutation and their type
2 Causes of mutation
3 Common genetic diseases in man
4 Genetic engineering

SUGGESTED READINGS MATERIALS

1 Cytology ,Genetics,& evolution. P.K. Gupta
2 Genetics , D. Peter Snustad& Michal J. simmon.

MZOO 302 : TOOLS AND TECHNIQUES IN BIOLOGY

Unit-I

1. Photobiology : Nature, properties, spectrum of light, & interaction of light on organism.
2. Principle (magnification and resolving power) and working of compound microscope
3. Electron microscope : SEM and TEM
4. Phase Contrast and interference Microscope

Unit-II

1. pH metry : pH definition, Principles of pH meter Types of electrodes .
2. Centrifugation : Types and principles of centrifugation, Ultracentrifugation and its application.
3. Electrophoresis (Principles, types and application) electrophoresis media
4. Chromatography

Unit-III

1. Spectrophotometry and colorimetry
2. MRI
3. ELISA
4. Micrometry and microtomy

Unit-IV

1. Biosensors
2. Autoradiography
3. X-ray
4. Flow cytometry

Unit- V

1. Ultrasound
2. NMR
3. ECG
4. Endoscopy

MZOO 303 : DEVELOPMENTAL BIOLOGY

UNIT-I

1. Oogenesis& Differentiation and growth of oocytes
2.Organization of egg cytoplasm and egg cortex.
3. Vitellogenesis
4. Spermatogenesis and ultrastructure of sperm

UNIT-II

1. Fertilization
2. Biological role of fertilization
3. Biochemistry of fertilization
4. Cleavage and mechanisms of cleavages

UNIT-III

Fate maps

Presumptive areas in early embryos of

a) 1 Amphioxus
b) 2 Fishes
c) 3 Amphibian
d) 4 Birds

5. Differentiation

UNIT-IV

1. Cell and tissue interactions in development
2. Primary embryonic induction and Competence
3. Concept of organizer
4. Metamorphosis
5. Teratology

SUGGESTED READINGS MATERIALS

• Animal Gametes- Vishwanath, Asia Publishing House
• Foundation Of Embryology- Bradley M. Patten, McGrow Publication
• Fertilization In Animals- Brain Dale, ArlondHeiniman, Gulab Vazerani Publication
• Development Biology - N.J. Berril, Tata McGraw Hill Publication N. Delhi
• Embryology Of Vertebrates – Nelson

MZOO 304: IMMUNOLOGY & DIESASES

UNIT-I

1. Cells of immune system
    - 1.1 B-Lymphocytes, T-lymphocytes, Null Cells
    - 1.2 Mononuclear cells
    - 1.3 Granulocytic cells (Neutrophils, Eosinophils and Basophils)
    - 1.4 Mast cells
    - 1.5 Dendritic cells
2. Organs of immune system
    - 2.1 Primary lymphoid organs (Thymus, bone marrow)
    - 2.2 Secondary lymphoid organs (Lymph nodes, spleen, mucosal associated lymphoid tissue, cutaneous associated lymphoid tissue)

UNIT-II

1. Immunoglobulin structure and function
2. Immunoglobulin classes
    a. lgG
    b. lgM
    c. IgE
    d. lgD
3. Monoclonal antibodies
4. Antigens- Immunogenicity

UNIT-III

1. Contribution of the immunogens.
2. Contribution of Biological system.
3. Antigen - Antibody Interaction
4. Antibody affinity and activity
5. Cross reactivity
6. Agglutination reactions
7. Precipitation Reaction

UNIT-IV

1. Vaccine
2. Active and passive immunization
3. Whole organism vaccine
4. Recombinant vector vaccines
5. DNA vaccines

UNIT-V

1. Immune system in Health disease
2. Immune response to infectious disease
3. Immune response in cancer
4. Pathophysiology of parasitic infection
5. Viral infections
6. Bacterial infection
7. Helminths infection
8. AIDS

SUGGESTED READINGS MATERIALS

• Animal Gametes- Vishwanath, Asia Publishing House
• Foundation Of Embryology- Bradley M. Patten, McGrow Publication
• Fertilization In Animals- Brain Dale, ArlondHeiniman, Gulab Vazerani Publication
• Development Biology - N.J. Berril, Tata McGraw Hill Publication N. Delhi
• Embryology Of Vertebrates - Nelson

MZOO 305P
LAB COUSE-I: (PRACTICAL BASED ON PAPER I &II)

1. Study of slides of development of frog.
2. Study of development of Hen's egg, by cover glass window method, staining and mounting of blastodisc.
3. Study of caudal regeneration in Teleost (Meal time effect).
4. Study of embryological slides: spermatogenesis, oogenesis, histology of gonads.
5. Study of effect of NaF/urea on growth of fish fingerlings.
6. Study of effect of thyroid hormone on metamorphosis of tadpole
7. Other exercises related to theory paper

MZOO 306P
LAB COUSE-I: (PRACTICAL BASED ON PAPER III&IV)

Parts study, principles and use of following instruments for different techniques:

1. pH meter
2. Determination of pH of different soil and water samples.
3. Spectrophotometer: Preparation of absorption spectrum.
4. Chromatography: Paper and thin layer chromatography..
5. Electrophoresis: Paper and gel electrophoresis.
6. Microscope: Parts study and principles of various microscopes.
7. Problems on genetics (complete and incomplete linkage; dominance, sexlinked inheritance)
8. Demonstration of Hardy-Weinberg law
9. Experiments based on population genetics, pedigree analysis.
10. Study of evolution of horse by way of models.
11. Study of evolution through homologous and analogous organs.

M. SC. ZOOLOGY SEMESTER – IV

MZOO401: Animal Behaviour

Unit 1

1. Behaviour: Definition - Innate behavior, learning, reasoning, motivation, conflict and sexual behavior.
2. Migration and homing with special reference to birds.
3. Communication in animals: Visual, olfactory, auditory and tactile.
4. Camouflage and Mimicry – types of mimicry

Unit 2

1. Ecological Aspects of Behavior: Habitat selection, food selection and optimal foraging theory, anti-predator defense mechanisms, aggression, territoriality and dispersal.
2. Social Behavior: Aggregations – Schooling in fishes, flocking in birds, herding in mammals.
3. Group selection, kin selection, altruism, inclusive fitness.
4. Social organization in insects and primates.

Unit 3

1. Reproductive Behavior: Evolution of sex andsexual selection
2. Reproductive strategies, mating systems, courtship, sperm competition, and parental care.
3. Hormones and behavior,
4. Pheromones and behavior.

Unit 4

1. Biological rhythms: Circadian, circannual, tidal/lunar
2. Synchronization of biological rhythms, phase shift.
3. Photoperiodism with reference to birds
4. Mammals - human circadian rhythms.

Unit 5

1. Niche hypothesis
2. Hardy Weinberg Law
3. Reproductive Strategies (R & K Selcetion)
4. Metapopulation

Suggested Readings:

• _Drickamer&Vessey: Animal Behaviour , Concepts, Processes and Methods (Wadsworth)
• _Grier: Bi~logy of Animal Behaviour (Mosby College)
• _Immelmann: Introduction to Ethology (Plenum Press)
• _Lorenz: The Foundation of Ethology (Springer -Verlag)
• _Manning: An Introduction to Animal Behaviour (Addison - Wesley)
• _McFarland: Animal Behaviour, Psychology, Ethology and Evolution (Pitman)
• _Price & Stoker: Animal behaviour in laboratory and field (Freeman)
• _Wood -Gush: Elements of Ethology (Chapman and Hall)

MZOO402 : Wildlife and Conservation Biology

Unit 1

1. Wildlife in India & threatened wildlife.
2. Reasons for wildlife depletion in India.
3. Wildlife conservation approaches and limitations.
4. National and State mammals and birds of India.
5. Wild life Habitat- Characteristic, Fauna and Adaptation with special reference to Tropical forest.
6. Protected Area concept: National Parks, Sanctuaries and Biosphere Reserves, cores and Buffers, Nodes and corridors. Community Reserve and conservation Reserves

Unit 2

1. Management of Wildlife- Red Data Book and Conservation status (endangered, vulnerable, rare, threatened and near threatened species).
2. Wild life Trade & legislation- Assessment, documentation, Prevention of trade.
3. Policies and laws in Wild life management (national) and ethics.
4. Habitat utilization pattern, threats to survival of Slender Loris, Musk deer, Great Indian Bustard, Olive Ridley turtle.

Unit 3

1. Biodiversity extinction and conservation approaches- Perspectives and Expressions.
2. Identification and prioritization of Ecologically sensitive area (ESA). Coarse filter and fine filter approaches.
3. Regional and National approaches for biodiversity conservation.
4. Theory and analysis of Conservation of populations

Unit 4

1. National and International efforts for conservation- Information on CITES, IUCN, CBD
2. Convention on wetlands of International Importance (Ramsar convention).
3. Important projects for the conservation of endangered species in India.
4. Conservation of Natural Resources- Resources: Types and Degradations

Unit 5

1. Principles of Remote Sensing and Geographical Information System
2. Basic components of RS & GIS
3. Various software used in RS & GIS
4. Application of RS & GIS in biodiversity conservation

Suggested readings:

• _M.Kato. The Biology of Biodiversity, Springer.
• _J.C. Avise. Molecular Markers, Natural History and Evolution, Chapman & Hall, New York.
• _E.O. Wilson. Biodiversity, Academic Press, Washington.
• _G.G. Simpson. Principle of animal taxonomy, Oxford IBH Publishing Company.
• _E. Mayer. Elements of Tax onomy.
• _E.O. Wilson. The Diversity of Life (The College Edition), W.W. Northem& Co.
• _B.K. Tikadar. Threatened Animals of India, ZSI Publication, Calcutta.

MZOO403 : (optional paper) Ichthyology (Fish) Structure and Function

UNIT-I

Origin and evolution of fishes

1. Classification of fishes
2. Fish integument
3. Scales & Fins
4. Locomotion

UNIT-II

Accessary respiratory organs

1. Alimentary canal
2. Respiratory organ
3. Air bladder and its functions
4. Weberian ossicles and functions

UNIT-III

Luminous organs

1. Excretion
2. Acoustico-lateral line system
3. Colouration in fishes
4. Sound producing organs

UNIT-IV

migration in fishes

1. Deep sea adaptions
2. Hill stream adaptions
3. osmoregulation
4. parental care in fishes

UNIT-V

1. Early development and hatching
2. Poisonous and venomous fishes.
3. Reproductive System
4. Skeleton system

SUGGESTED READINGS MATERIALS

- Greenwood - Inter relationship of fishes.
- Gopalji, Srivastava - Freshwater fishes of U.P. and Bihar.
- Brown -Physiology of fishes Vol. I &II.
- Hoar and Randall -Fish physiology of fishes Vol. 1 & IX.
- Gunther Sterba C.N.H.-Freshwater fishes of the world
- W. Lanharn -TheFishes.
- G.V. Nikolsky -The ecologyof Fishes,
- Borgstram -Fish as food Vol. I &II.

MZOO404: (Optional) Pisci Culture and Economic Importance of Fishes (Ichthyology)

UNIT-I

1. Collection of fish seed from natural resources and transportation of fish seed.
2. Breeding in fish, Bundh breeding and Induced breeding
3. Management of fish farm.
4. Physiochemical factors of freshwater for fish farming.

UNIT-II

1. Composite fish culture
2. Prawn culture
3. Fisheries resources of C.G.
4. Riverine fisheries .

UNIT-III

1. Fish cum paddy culture
2. Marine fisheries
3. Pearl fisheries
4. Aquarium fishes

UNIT-IV

1. Offshore fisheries
2. Deep sea fisheries
3. Role of fisheries in rural development
4. Sewage fed fisheries

UNIT-V

1. Fish preservation
2. Fishing Method.
3. Economic importance and by product of fishes
4. Fish disease.

SUGGESTED READINGS MATERIALS

• JR. Norman - The History of fishes.
•Nagaraja Rao - An introduction to fisheries.
•LaglerIchthyology.
•Herclen Jones Fishmigration.
• Marshal The life offishes.
• Thomas - Diseases offish.

MZOO405 : Dissertation and Viva-voice

Research problem and research design: Selecting research problem; necessity of defining a problem; techniques involved in defining the problem; meaning of research design; need for research design; important concepts related to research design; different research designs; basic principles of experimental design; important experimental designs. Interpretation and report writing: Meaning of interpretation; technique of interpretation; precautions in interpretation; significance of report writing; layout of research report; types of reports; Presentation of research work- _oral, poster and writing research paper; Precautions for writing research report.

Review of related literature: Understanding the role of review; how to begin a search for related literature- _Library reference, recording and indexing, classification of references, internet sites for biological references; downloading the information through internet; requests for reprints through e-mail and post; classification and filing of reprints. Writing research proposal: Characteristics of a proposal; content and organization of a proposal; weakness in proposal seeking funding.

Defining research question, Approaches and Methodology, Documentation and presentation of data, Analysis and Interpretation of Data, Writing of research proposal, report and Research paper: Meaning and types – Structure –Documentation : Footnotes and Bibliography-Editing the final draft –Evaluating the final draft –Checklist for the good proposal /research/report.

MZOO406P : LAB COUSE-I: (PRACTICAL BASED ON PAPER II to IV)

1. Mounting and identification of fish scales.
2. Identification of fishes by fin formula .
3. A visit to local fish landing site or fish farm and fish food packaging sites.
4. Demonstration of various fish catching gadgets.
5. Collection and identification of local fishes by fin formula by students (have to collect and submit a specimen at time of examination).
6. Maintenance of aquarium and knowledge of aquarium fishes.
7. Study of insect behavior in response to various environmental factors.
8. To study the geotaxis behavior of earthworm.
9. To study the phototactic response in earthworm or grain/pulse pest.
10. Determination of effect of time on schooling behavior in fish.
11. Toxicological response of fish opercular and surfacing activity.
12. To study the food preference in Tribolium or grain/pulse pests.
13. To study the web construction and habituation in spider.