

MAA VINDHYAVASINI UNIVERSITY

MIRZAPUR (U.P.)



Syllabus

For

Zoology

Master of Science Two Year Programme

(NEP-2020 Based Curriculum)

Effective From Session 2026-27

Department of Zoology

Faculty of Science and Technology


Convener
Board of Studies
Maa Vindhyavasini University, Mirzapur

TWO YEAR P.G. PROGRAMME EFFECTED TO 2026-27
DEPARTMENT OF ZOOLOGY
FACULTY OF SCIENCE & TECHNOLOGY
MAA VINDHYAVASINI UNIVERSITY, MIRZAPUR

TWO YEAR FULL TIME PROGRAMME
AFFILIATION

The proposed programme shall be governed by the Department of Zoology, Faculty of Science & technology Maa Vindhyavasini University, Mirzapur.

PROGRAMM STRUCTURE

The M.Sc. Programme is divided into two parts as under. Each part will consist of two semesters as given bellow.

Semester-Odd Semester-Even

Part-I First Year

Semester-1 Semester-2

Part-II Second Year

Semester-3 Semester-4

Each first and second semester would consist of four papers (course) and one practical course (four credits for each paper). Semester III would have two compulsory papers and one special paper (to be selected any one from ZOO303A, ZOO303B, ZOO303C) and the fourth paper will be practical paper divided in two parts:

ZOO304A (General) and ZOO304B (Special) both carrying 4 Credits. Semester IV would comprise of one compulsory papers and two optional papers (ZOO402A, ZOO402B, ZOO402C, ZOO403A, ZOO403B ZOO403C) from which each student would have to select one and the fourth paper will be practical paper divided in two parts : ZOO404A (General) and ZOO404B (Special) both carrying 4 credits. It is mandatory for each student to complete a dissertation/research project, assigned in semester III semester IV and will carry 4 credits each.

Note :- * Research project will be evaluated at the end of 3rd and 4th semester, each have 4 credits, by Internal Examiner.





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Semester Courses of M. Sc .Zoology based on CBCS

The course of M. Sc. Zoology will be spread in two years previous and final. Each year will have two semester examinations and thus there will be total four semester examinations.

Programme Specific Outcomes of Zoology

1. Developing better understanding of concepts of biology at biochemical, molecular and cellular level, physiology and reproduction studying them at organism level, and ecological impact on animal behavior.
2. Developing the advance level of statistical knowledge which helps in data handling and practical assessments. There is extensive study of instruments so that the students can handle them with ease for further research work.
3. Developing the concept of animal adaptation by exploring the diversity of functional characteristics of various kinds of organisms which is closely related to evolutionary processes and environmental changes.
4. Understanding of Mendel's principle of heredity, its extension and chromosomal basis; chromosomal anomalies and associated diseases; developing concepts of regulation of gene activity in prokaryotes and eukaryotes of transcriptional and post transcriptional level.
5. Study of environment is focused with the aim to make students aware of the structure and function of environment and the climate change, adaptations and losses due to it.
6. Development of an understanding of animal science for its application in entomology, apiculture, aquaculture, agriculture and modern medicine.
7. Detailed acquaintance of developmental biology correlating it to the evolution. Elucidation of early embryonic development and organogenesis of invertebrates and vertebrates, explanation of embryonic stem cells and their application.
8. To understand animal physiology in detail and a comparative outlook between non vertebrates and vertebrate physiology.
9. Development of theoretical and practical knowledge in handling the animals and using them as model organism.
10. Each semester having a departmental seminar in order to make students aware of the research paper writing and presentation
11. To understand the impact of chemicals on biodiversity of microbes, animals and plants; Bioindicators and biomarkers of environmental health. Biodegradation and bioremediation of chemicals; competition and existence; intraspecific and interspecific interactions.
12. Dissertation work is incorporated as theoretical/practical project work with the aim to inculcate the ability to develop a research question, organize relevant available literature and development of technical writing skill.

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M.Sc. Previous (w.e.f.2026-27)

FIRST SEMESTER			
PAPER	NAME OF PAPER	MARKS	CREDIT
ZOO 101	Non- Chordata	100 (75+25)	4
ZOO 102	Biostatistics, Bioinformatics and Bioinstrumentation	100 (75+25)	4
ZOO 103	Environmental Biology	100 (75+25)	4
ZOO 104	Bio Chemistry	100 (75+25)	4
ZOO 105	Practical Examination	100 (75+25)	4
	Total	500	20

SECOND SEMESTER			
PAPER	NAME OF PAPER	MARKS	CREDIT
ZOO 201	Chordata	100 (75+25)	4
ZOO 202	Animal Physiology	100 (75+25)	4
ZOO 203	Genetics and Molecular Biology	100 (75+25)	4
ZOO 204	Endocrinology	100 (75+25)	4
ZOO 205	Practical Examination	100 (75+25)	4
	Total	500	20

M.Sc. Final (w.e.f.2027-28)

THIRD SEMESTER			
PAPER	NAME OF PAPER	MARKS	CREDIT
ZOO 301	Applied Zoology	100 (75+25)	4
ZOO 302	Developmental Biology	100 (75+25)	4
ZOO 303	Special (Select Anyone)		
ZOO 303 A	Fish Biology	100 (75+25)	4
ZOO 303 B	Taxonomy and Morphology		
ZOO 303 C	Developmental and Ecology Cell Biology Cytological Techniques		
ZOO 304 ZOO 304 A ZOO 304 B	Practical Examination General and Special	100 (75+25)	4
ZOO 305	Research Project*/Only Literature Survey	100	4
	Total	500	20

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FOURTH SEMESTER			
PAPER	NAME OF PAPER	MARKS	CREDIT
ZOO 401	Animal Behaviour and Systematics	100 (75+25)	4
ZOO 402 ZOO 402 A ZOO 402 B ZOO 402 C	Special Paper 1(Select Anyone) Fish Biology Applied Ichthyology and Development Entomology Evolution and Taxonomy Cell Biology Ultra Structure and Morphodynamics of Cell	100 (75+25)	4
ZOO 403 ZOO 403 A ZOO 403 B ZOO 403 C	Special Paper 2 (Select Anyone) Fish Physiology and Ecology Entomology Economics Entomology Cell Biology Cell Regulation and Principles of Biotechnology	100 (75+25)	4
ZOO 404 ZOO 404 A ZOO 404 B	Practical Examination General and Special	100 (75+25)	4
ZOO 405	Research Project/Dissertation	100	4
	Total	500	20

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Syllabus for M.Sc. (Zoology)

Semester I

ZOO101–Non-chordata Marks 100(75+25)Credit 4

Unit1

Protozoa, Porifera and Coelenterata

Protozoa-Locomotion- locomotory organelles and methods of locomotion, Nutrition- Holozoic, Holophytic, Saprophytic and Myxotrophic nutrition, Reproduction- Asexual and sexual, Protozoa and Diseases

Porifera-Skeleton-Spicules and sponging, Canal System-Types and functions of canal system

Coelenterata-Origin of Metazoa, Polymorphism- Basic forms and patterns, Importance of polymorphism, Corals-coral polyp, coral skeleton, types of corals. General organization and affinities of Ctenophora

Unit2

Platyhelminthes and Aschehelminthes

Parasitism in Platyhelminthes and Aschehelminthes, Parasitic adaptations in Trematodes and Cestodes-

Morphological and physiological adaptations, larval stages of Trematoda and Cestoda

Unit3

Annelida and Arthropoda

Segmental organs, Filter feeding, Coelom and Metamerism. Larval forms of crustacean, Parasitism in crustacean, Respiration in Arthropods, General organization in Onychophora

Unit4

Mollusca and Echinodermata

Respiration in Mollusca, Torsion in Gastropods, Water vascular system and Larval forms in Echinodermata.

Suggested readings

Barnes et al(2009).The Invertebrates: A synthesis. Wiley Backwell

Hunter: Life of Invertebrates (1979,Collier Macmillan)

Marshall: Parker & Haswell Text Book of Zoology ,Vol.I(7thed1972,Macmillan)19

Moore: An Introduction to the Invertebrates(2001,CambridgeUniversityPress)

Brusca and Brusca(2016)Invertebrates Sinauer

Jan Pechenik (2014)Biology of the invertebrates McGrawHi

ZOO102– Biostatistics, Bioinformatics and Bioinstrumentation Marks 100(75+25) Credit 4

Unit 1

Biostatistics

Population sample, random sample, tabular and graphical representation of data

Major of central Tendencies (Mean, Median, Mode), Standard deviation, Variance, Co-efficient of variance, Analysis of Variance

Unit 2

Bioinformatics

Biology & IT, Computers in Biology and medicine, Introduction to Genomics and Proteomics etc, Definition and

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terminology: Cladogram, Dendrogram, Phylogram and Phenogram; Operational taxonomic unit (OTU), Informative sites. Biological sequence data banks (GENBANK, EMBL, PDB)

Unit3

Biological Techniques

Working principles, types and application of: Colorimetry, Spectrophotometry, Centrifugation, Chromatography, Electrophoresis.

Unit 4

Microscopy

Principles and construction of –Compound microscope, Phase contrast microscope, Electron microscope (SEM, TEM)

Suggested readings

Statistical Methods (Eighth Edition) by G .W. Snecdecor and W. G. Cochran, Willey Blackwell

Biostatistics (Tenth Edition) by W. W.Daniel and C.L. Cross, Wiley Introductory

Primrose: Molecular Biotechnology Panima 2001

Clark &Switzer: Experimental BiochemistryFreeman2000

Bioinformatics-Sequence and Genome Analysis-David W. Mount, CSHL Press

Molecular Systematics, 2nd ed. D.M. Hillis, C. Moritz and B.K. Mable, Sinauer Associates, Sunderland. Massachusetts.

Fundamental Concepts of Bioinformatics, Krane, D.E. and Raymer M.L. Pearson Education

ZOO103-Environmental Biology Marks 100(75+25) Credit4

Unit1

Population Ecology

Characteristics of Population, Population size and exponential growth , Population dynamics, Competition ,Intra-specific and Inter-specific competition , Mutualism and Commensalism

Unit 2

Ecosystem

Nature of Ecosystem, Production, Food webs and Energy flow through ecosystems, Biogeochemical cycle66, Biomes

Unit 3

Environment

Environmental stresse, Global warming, Acid Rain, Environmental contaminants-their uptake and bioaccumulation and biotransformation, Bio-indicators and Biomarkers

Unit 4

Biodiversity

What is Biodiversity,

Biodiversity Types: (a) Species, Ecosystem level, Genetic Level: (b) Alpha, Beta, Gamma level; Indian Biodiversity & Its Distribution; Importance/Significance; Biodiversity Hotspots/Parks; Keystone species, Indicator Species

Suggested Readings

Biodiversity and Ecosystem functioning. edited by Michel Lorean ,Shahid Naureen and Pablo Inchausti (Oxford

University Press.)

Biodiversity and Conservation in Forests By Diana. F. Tomback. Publication MDPI Multidisciplinary Digital Publishing Institute.

Fundamental Processes in Ecology: An Earth System Approach. 2007. Wilkinson, D.M. Oxford University Press, UK.

Essentials of Ecology G. T. Miller, Jr. & Scott E. Spoolman, 2014, Brooks/Cole, Cengage Learning

Fundamentals of Ecology. E.P. Odum & Gray. W. Barrett, 1971, Saunders.

Handbook of Population 2005, Dudley L. Poston, Michael Micklin, Springer

ZOO104–Biochemistry Marks 100(75+25) Credit 4

Unit 1

Bioenergetics - Elementary thermodynamics- First law and second law of thermodynamics, Cell as an open thermodynamic system, Calculation of free energy change during biological oxidation-reduction reactions

Unit 2

Enzymes- Kinetics, inhibition, mechanism of action, Michaelis and Menton equation, Allosteric enzymes, isoenzymes, Ribozymes, Abzymes.

Unit 3

Carbohydrates- Structure, general properties and biological significance, Lipids- Classification, structure, general properties and biological significance, Metabolic pathways- Glycogenesis and Glycogenolysis, HMP shunt, Oxidative phosphorylation, Beta oxidation of fatty acids

Unit 4

Amino Acids: Structure, properties and metabolism, Ramachandran plot, protein isolation, solubilities and protein targeting

Classification and significance of Vitamins

Suggested readings

Nelson & Cox Lehninger's Principles of Biochemistry McMillan 2000

Zubay et al Principles of Biochemistry WCB 1995

Voet & Voet Biochemistry Vols 1 & 2 Wiley 2004

Murray et al Harper's Illustrated Biochemistry McGraw Hill 2003

Wilson and Walker Practical Biochemistry—Principles and Techniques Cambridge University Press

ZOO105–Practical Examination Particulars Marks 100(75+25) Credit 4

Labeling of Dissected animal figures (one lower and one higher non-chordate)-05+05 Preparation- 05

Spotting (10)–20

Environmental Biology exercise-10 Biochemistry exercise- 10

Biostatistics exercise-10

Class record, collection and viva 10 TOTAL 75

Major Dissections Labeling: Labeling of dissected circulatory system and reproductive system of earthworm, Reproductive and Nervous system of Unio, Pila, Prawn, Sepia and other available non- chordates.

Preparations: Slide preparation of Euglena and Paramecium, sponge gemmules, Obelia colony, Nereis

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parapodia, Hastate palate of Prawn, salivary glands of Cockroach, mouth parts of other insects.

Museum study: General survey and classification of lower non-chordates

Protozoa- Prepared slides of Paramecium (conjugation and binary fission), Euglena, Vorticella, Ceratium, Noctiluca.

Porifera-Museums of Euplectella, Spongilla, Euspongia Prepared slides of T.S. Sycon, L.S. Sycon, Spicules of sponges.

Coelenterata-Museums of Physalia Corallium, Madrepora, Fungia, Pennatula, Metridium, Vellela, Porpita, Tubipora, Gorgonia, Prepared slides of Hydra, Obelia,

Helminths- Museums of Taenia solium, Cysticercus larva of Taenia solium, Schistosoma, Ascaris male, Ascaris female, Ancylostoma,

Annelida-Nereides, Heteroneries, Aphrodite, Chaetopterus, Arenicola, Terebella, Pheretima, Eutyphoeus, Dero, Branchellion, Bonellia, Sipunculus and other available museums

Arthropoda- Museums and slides of major representatives of different classes of phylum Arthropoda Mollusca-

Museums and slides of major representatives of Mollusca

Echinodermata-Museum and slides of major representatives of Echinodermata.

Prepared slides—Miracidium larva, Redia larva, Cercaria larva, Scolex of Taenia solium, Mature proglottid and gravid proglottid of T. solium, T.S of Mature proglottid and gravid proglottid of T. solium, T.S. through body of male Ascaris, T.S. through body of female Ascaris, T.S. Nereides through body segments, Parapodium of Nereides, etc.

Environmental Biology exercise-Study of different structural adaptations to ecological conditions Study of micro and macro fauna of soil by froth-floatation method

Comparative study of physico-chemical eco-factors in different localities-temperature, pH Estimation of CO₂, O₂, carbonate in freshwater

Study of plankton in a water body

Study of biological effects of certain pollutants

determination of glycogen in animal tissues. Kinetic assay of salivary amylase and study of the effects of time and temperature on urease activity

Biostatistic exercise- Experiments on probability, sampling of data for frequency diagram and calculation of mean, median and mode and standard deviation.

Semester II

ZOO201- Chordates Marks 100 (75+25) Credit 4

Unit I

Origin of Chordates; Origin of Gnathostomes Pisces: Ostracoderms and Devonian fishes,

Unit II

Lung fishes and their peculiar features. Amphibia: Origin of Tetrapoda

Unit III

Origin and Evolution of Reptiles, Mesozoic reptiles, Extinct reptiles, Origin of birds, Flightless birds

Unit IV

Mammals

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Origin and evolution of Mammals, Characteristic features of Monotremes, Marsupials and Placentals Aquatic mammals

Suggested Readings

Harvey et al: The Vertebrate Life(2006)

Colbert et al: Colbert's Evolution of the Vertebrates: A history of the backboned animals through time (5th ed 2002, Wiley - Liss)

Hildebr and: Analysis of Vertebrate Structure(4th ed 1995, John Wiley)

McFarland et al: Vertebrate Life(1979, Macmillan Publishing)

Parker and Haswell: Text Book of Zoology, Vol. II (1978, ELBS)

ZOO202-Animal Physiology Marks 100 (75+25) Credit 4

Unit1- digestion and respiration

Physiology of Digestion- Digestion and Absorption of Proteins, Carbohydrates and lipids

Physiology of Respiration- Gaseous exchange in terrestrial and aquatic animals, Respiratory pigments

Unit 2- circulation and immune system

Physiology of Circulation Patterns of Circulation among different animals, Physiological categories of Heart, Haemodynamics

Unit 3- excretion and movement

Physiology of Excretion- Excretory products, Biosynthesis of Urea, Structure and functional mechanism of nephron

Physiology of Muscle Contraction- Structure and Mechanism of Contraction of skeletal muscles

Unit4-Concept of Homeostasis

Physiology of Defense Mechanism Immunity, Types of Immune response, Immune cells, Antigen and antibody reaction, Antibody diversity

Suggested readings

Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Harcourt Asia PTE Ltd. / W.B. Saunders Company.

Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology XI Edition John Wiley & sons

Christopher D. Moyes, Patricia M. Schulte 2016 Principles of Animal Physiology. 3rd Edition, Pearson Education Hill, Richard W., et al. Animal physiology. Vol. 2. Sunderland, MA: Sinauer Associates, 2004.

Chatterjee CC (2016) Human Physiology Volume 1 & 2. 11th edition. CBS Publishers

ZOO203-Genetics and molecular biology Marks 100 (75+25) Credit 4

Unit-1

Basic concept of mendelian inheritance, gene interaction, epistasis, complementation test, sex linked inheritance, sex limited and sex influenced trait, cytoplasmic inheritance, genomic imprinting, environment and heredity, pleiotropy, Genetic disease testing and gene therapy

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Unit-2

Linkage, crossing over and recombination, recombination frequency, gene mapping, gene mutation, chromosomal mutation- and their significance

Unit-3

Bacterial genome, transformation, transduction, conjugation, bacteriophage, Chromosomal organization of DNA in eukaryotes, transposable elements in prokaryotes and eukaryotes, role of transposable elements in genetic regulation

Unit-4

DNA replication in prokaryote and eukaryotes, chromosome and gene, gene expression and regulation- transcription in prokaryotes and eukaryotes, translation in prokaryotes and eukaryotes, uptake in endoplasmic reticulum, trafficking mechanism of protein, operon model- lac operon and trp operon

Suggested reading-

Genetics- Benjamin A pierce

Gardner et al Principles of Genetics John Wiley 1991

Hartl and Jones Genetics-Principles and Analysis Jones & Bartlett 1998

Hartwell et al Genetics: From Genes to Genomes McGraw-Hill 2004

Snustad and Simmons Principles of Genetics JohnWiley& Sons

Russell Genetics

ZOO204: Endocrinology Marks 100(75+25) Credit 4

Unit1

Hormones as messengers and their types, Structure and functioning of Pituitary, Pancreas, Adrenal Glands

Unit2

Phylogeny of Thyroid gland, Structure and functioning of Thyroid, Parathyroid, and Gonads

Unit3

Nature of action of peptide and steroid hormones, Biosynthesis and secretion of Hormones

Unit4

Neuro endocrine system and neuro secretion, Hormones and Behaviour

Suggested Readings:

William's Text Book of Endocrinology: Shlomo Melmed, Kenneth S. Polonsky, P.Reed Larsen

Guyton's textbook of Medical Physiology

ZOO205-Practical Examination Particulars Marks 100 (75+25) Credit 4

Labeling of major Chordate systems (dissected)-10 Comparative osteology of different classes of vertebrates-10

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Preparation- 05

Spotting (10)-20

Physiology exercise- 05

Molecular Biology exercise-05

Cytology and Genetics exercise- 05 Class record, tour and collection-10 Comprehensive viva - 05

TOTAL 75

Major Dissection Labeling: labeling of cranial nerves of major representative types of fish and amphibian. Afferent and efferent branchial arteries of scoliodon, urinogenital system of scoliodon.

Comparative Osteology Study of bones of different chordate class with focus on evolutionary significance

Preparation- Placoid scale of scoliodon, Ampulla of Lorenzini; T.S. through liver, intestine, skin etc of frog.

Museum study- Study of museums and slides of representative types of Protochordates, Cyclostomata, fishes and amphibian, Reptilia, Aves and Mammalia

Physiology exercise- Total counts of erythrocytes, total leucocyte counts and differential leucocyte counts of fish, frog, bird and rat Estimation of hemoglobin content in fish, frog, bird and rat Rate of Oxygen consumption of aquatic animals and effects of different stresses upon it Determination of respiratory quotient of an air breathing animal Study of functional properties of the cardiac muscles of frog using acetylcholine and adrenalin

Molecular Biology exercise- Isolation and colorimetric determination of protein from fat bodies of cockroach and liver Isolation and colorimetric determination of DNA from fat bodies of cockroach and liver

Cytology and Genetics exercise Demonstration of mitochondria in human buccal epithelium by supra vital staining. Study of mitosis in onion root tip and meiosis in testis of grasshopper with acetocarmine squash method, Study of salivary gland chromosomes of Drosophila and Chironomos Study of the pattern of different hereditary traits in human beings

M.Sc. FINAL YEAR M.Sc. (Zoology)

Semester III

ZOO301–Applied Zoology Marks 100 (75+25) Credit 4

Unit1

Aquaculture; marine, riverine and lacustrine fishes; Some food fishes of India: Wallago, Anquilla, Harpodon, Notopterus, Channa, Clarias, Labeo, Catla, Cirrhinus, Barbus: Fish culture in India: Culture of Carps.

Unit2:

Domestication of animals- Animal husbandry and Poultry: Important breeds of cattle in India, Exotic breeds, cattle breeding, artificial insemination, feeding and management of dairy stock, dairy product and chemistry of milk, poultry industry in India, important poultry breeds, poultry farming, disease of fowl.

Unit3:

Apiculture : importance of Bee keeping, Apiculture, Apis species, bee hive, social life of honey bee, properties of

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Unit2

Physiology

Anatomy of digestive system and nutritional physiology (nutritional requirement, feeding behaviour and food utilization)

Circulatory system and components of hemolymph, excretory organs and physiology of excretion

Respiratory organs, physiology of respiration and respiratory adaptations of aquatic and endoparasitic insects,

Reproductive organs and different modes of development

Unit3

Development

Postembryonic development, different type of larvae and pupae and hormones control of diapause

Unit 4

Ecology

Role of temperature, humidity and light in development and metamorphosis

Origin and evolution of apterygotes and pterygotes and their Interrelationships

ZOO303C: Cell Biology Cytological Techniques**Unit I**

Elementary principles of phase, interference, polarization, electron and Scanning electron microscope

Unit II

Theory and application of freeze – drying, X-ray diffraction, radio autography, Fluorescent antibody techniques and differential centrifugation. Methods of tissue culture

Unit III

Theoretical basis of colorimetric and biochemical estimations of nucleic acid, proteins

Unit IV

Chemical basis of fixation and cytochemical localization of proteins, lipids, glycogen, RNA, DNA, phosphatases, esterases and oxidases Biosynthesis of proteins and Nucleic Acids

ZOO304 – PRACTICAL EXAMINATION Marks100 (75+25) Credit4**ZOO304 A: GENERAL AND ZOO304 B- SPECIAL**

Fieldstudy-05

Preparation-Microtomy- 05

Developmentalbiology-05

Endocrinology-05

Spotting (05)- 10

Class record, collection and viva05

a. Fishery Biology

Major Dissection-10

Preparation- 05 Identification of One fish-05 Spotting (05)- 10

Seminar-05
Class record, collection and Viva- 05

b. Entomology
Dissectionmajor-10
Dissection minor 05
Identification of one insects-05
Seminar- 05
Spotting (5) 10
Class record, collection andviva-05

(C)Cell Biology
Cytologicallocalization-10
Vital staining-05
Microtomy-05
Seminar05
Spotting (5) 10
Classrecordandviva05

Field Study Field study at different Government/ Non Government farm houses/ apiaries/ dairies/ poultries/ seri culture in local areas and project has to be submitted.

Preparation- Microtomy of tissues (from block making to section cutting, stretching etc.)

Museum study- Study of different culture animals (including fishes, cattles, poultry, bees, silk worm and earthworms)

Developmental Biology- Study of life stages of frog, mounting of eggs and embryo of frog, incubation and mounting of chick embryo, study of prepared slides of embryo of frog, chick and mammal, egg window

Endocrinology- Study of prepared slides of different endocrine glands of fish and frog, dissection of vertebrate types to demonstrate different endocrine organs

ZOO305- RESEARCH PROJECT/ [ONLY LITERATURE REVIEW- CREDITS: 4

Candidate has to perform literature survey related to any book, article or journal on any topic of their choice in biological science.

Candidates are evaluated on 100 marks consisting 4 credits

Semester IV

ZOO401-Animal Behaviour and biosystematics Marks 100(75+25) Credit 4

Unit-I:

Reflexes and complex behavior; orientation; primary and secondary orientation kinesis-orthokinesis and klinokinesis, taxis-different kinds of taxis

Unit-II:

Fixed action pattern; mechanism, deprivation experiment, controversies; FAP characteristic and evolutionary

feature; learning and instincts, conditioning, habituation, sensitization

Unit-III:

Innate releasing mechanism; key stimuli, stimulus filtering, supernormal stimuli, mimetic releaser, code breaker, Homeostasis and behavior; motivational system, physiological basis of motivation; Hormones and pheromones influencing animal behavior

Unit-IV:

Definition and basics concept of biosystematics & Taxonomy: Historical resume of systematic and its important and application in biology; trends in biosystematics: concepts of different conventional and newer aspects – chemotaxonomy, cytotoxonomy, ethotaxonomy, molecular taxonomy and numerical taxonomy. Dimensions of speciation and taxonomic characters: type of lineage changes, production of additional lineage, species concepts – species category, different species concepts, subspecies and infraspecific categories, theories of biological classification hierarchy of categories taxonomic and nontaxonomic character

Suggested Readings:

Manning, A. An Introduction of Animal Behaviour

Russell E.S. The behavior of Animals

Mc Farland, D. Animal Behaviour: Psychology, Ethology & Evolution.

Alcock, J. Animal Behaviour: An evolutionary approach

Dugatkin, L.A. Principles of Animal Behaviour

Silverman, P. Animal Behaviour in the laboratory

Biology Systematics by A. Mielli, Chapman and Hall

Methods and principle of systematic Zoology by E. Mayr, E.G. Linsley, R.L. vsinger, McGraw – Hill Book Company, ICN

ZOO402-Special Paper I Marks 100 (75+25) Credit 4

ZOO402A Fishery Biology

Applied Ichthyology and development

Unit 1

[i] Fisheries of India; Brief study of Marine, fresh water, estuarine and coldwater fishery.

(ii) Fish Farming- Type of fish farming, fish ponds, construction of fish ponds, physicochemical and biological characteristics of ponds

(iii) Fertilization and management of fishery pond (spawning, hatcheries, rearing, stocking), transport, mortality of fish fry

(iv) Composite culture and cage culture

Unit 2

[i] Principle and importance of fish preservation, traditional and advanced methods of fish preservation sun-drying, salting, pickling, smoking, chilling, frying and canning etc.

(ii) Fish products like oil, fish sauce, fish glue etc.

Unit 3

[i] Application of genetics in aquaculture—sex manipulation, chromosomal manipulation, gene engineering.

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- (ii) Transgenic fish
- (iii) Production of monosex and sterile fish and their Significance in aquaculture
- (iv) Induced breeding

Unit4

Development:
 Gastrulation
 Neurulation
 Organ formation
 Larval development
 Metamorphosis

ZOO403A Special Paper II Marks 100(75+25) Credit 4

Physiology and Ecology

Unit 1

Nutrition-Alimentary canal, associated glands Food and feeding habits, digestion
 Excretion-Kidney structure and modifications nitrogenous and excretory products, urine formation
 Osmoregulation- Definition, osmoregulation in freshwater, marine and migratory fishes.

Unit2

Respiration- Structure and function of gills
 Fish blood, process of respiration in a typical fish, accessory respiratory organs
 Circulatory System-Heart structure and function, Blood vessels, Arterial and venous system

Unit3

Reproduction-Gonads structure, spermatogenesis, Oogenesis, gonadal steroids, endocrine control of reproduction.
 Common enemies, symptoms etiology and treatment of disease of food fishes

Unit 4

Ecology:

- Abiotic factors : Density; Pressure; Temperature; salt content in water ;Light; Sound; Electric currents; Bottom deposits; Particles suspended in water.
- Biotic factors: interspecific relationship among fishes and with other organisms; Intraspecific relationship among fishes.
- Pollutants affecting fishery water with special reference to oil spills, domestic pollutants, industrial water, radioactive wastes and sewage fed fisheries.
- Plankton in relation to fish production

Special Paper I Marks 100 (75+25) Credit 4

ZOO402B ENTOMOLOGY

Evolution and Taxonomy

Unit I

Origin and evolution of apterygotes and pterygotes and their interrelationships

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Unit II

Thysanura: Machilidae; Lepismatidae Dictyoptera : Blattidae; Mantodeidae
Orthoptera: Tettigoniidae; Acrididae; Gryllidae; Gryllotalpidae
Isoptera : Termitidae; Kalotermitidae Siphunculata: Pediculidae; Haematopinidae
Hemiptera: Cicadidae; Jassidae; Lacciferidae Coccidae; Cimidae; Pyrrhocoridae Belostomatidae

Unit III

Lepidoptera: Pyralidae; Saturniidae; Bombycidae; Pieridae; Papilionidae; Lymantriidae
Diptera: Culicidae; Simuliidae; Chironomidae; Tabanidae; Drosophilidae Tachinidae; Muscidae;
Hippoboscidae.

Unit IV

Hymenoptera :Ichneumonidae; Aphidiidae; Formicidae; Vespidae; Apidae; Bombycidae
Coleoptera: Cicindellidae; Carabidae; Hydrophilidae; Scarabaeidae; Lampyridae; Tenebrionidae;
Meloidae ;Chrysomelidae; Curculionidae.

ZOO403B Special Paper II Marks 100 (75+25) Credit 4

Economic Entomology

Unit 1

Pests of stored grains: *Sitophilus oryzae*; *Tribolium castaneum*; *Callosobruchus chinensis*; *Corcyra cephalonica*
Pests of cotton : *Dysdercus* spp; *Earias vitella*; *Pectinophora gossypiella*
Pests of cereal –crops; *Heliothis armigera*; *Chilo zonellus*; *Leptocorysa varicornis*; *Hieroglyphus* spp.

Unit 2

Pests of fruits: *Idiocerus atkinsoni*; *Dacus cucurbitae*; *Papilio demoleus*
Pests of oil-seeds: *Bagrada cruciferarum*; *Athalia proxima*; *Lipaphis erysimi*

Unit 3

Different methods of insect management: Cultural; Mechanical; Biological chemical
Integrated pest management (IPM)
Properties, formulations, methods of application and mode of action of insecticides.
Physiology of insect resistance to insecticides

Unit 4

Life-history of beneficial insects
Life-history and biology of silk –worm and its products, Life-history and biology of honey-bee and its products. Life – history and biology of lac – insect and its products

ZOO402C Cell Biology Special Paper I Marks 100 (75+25) Credit 4

Ultrastructure and Morphodynamics of Cell

Unit 1

Morphodynamics of Cell
Ultrastructure and functions of the following:

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Cell membrane Nuclear membrane

Unit2

Cellular Organelles: Ultrastructure and Functions

Mitochondria

Golgi complex

Endoplasmic reticulum

Ribosomes.

Lysosomes

Unit3

The Chromosomes

Morphodynamics of chromosomes and the chromatic apparatus In cell division.

Mechanism of chiasma formation

Unit4

Cell Physiology

Physiology of a dividing cell

Chromosomal changes caused by ultraviolet and ionizing radiations

Carcinogenesis : Cytopathology; Possible somatic and viral causes

ZOO403C Special Paper II Marks 100 (75+25) Credit 4

Cell Regulation and Principles of Biotechnology

Unit 1

Regulation of cellular function; Hormone action: Hormone receptor Interaction; Membrane receptors; Steroid thyroid and epinephrine receptors; Second messengers (cyclic AMP: Cyclic GMP); Interferon.

Unit2

Genetic code

Genetic recombination, transformation, conjugation and transduction

Unit3

Application of genetic engineering and its prospects

Microbes and human welfare

Unit4

Thermodynamic principles and study-state conditions of living Organisms

Organization and methods to study metabolism

Degradation of glucose and nucleotides in animals

Energy metabolism and high energy compounds. Redox potentials

Mitochondrial electron transportchain Oxidative phosphorylation

Nature of enzymes

Classification and nomenclature of enzymes

Kinetic analysis of enzyme catalyzed reactions

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ZOO404A AND ZOO404B–PRACTICAL EXAMINATION GENERAL AND SPECIAL Marks 100 (75+25) Credit4

Practical related to Adaptation/Evolution 05

Animal Behaviour Exercise 05

Preparation 05

Spotting (5) 10

Class record, Tour and collection-05 Viva-voce - 05

ZOO404B-SPECIAL

Fishery Biology

Dissectionmajor-10

Dissectionminor-05

Preparation-05

Ecologyexercise-05

Spotting-(5)10

Class record, collection and viva-voce-05

Entomology

Dissectionmajor-10

Dissectionminor-05

Preparation-05

Physiologyexercise-05

Spotting (5) 10

Class record, collection and Viva- 05

Cell Biology

Quantitative estimation- 10

Cytologicalpreparation-10

Microbial exercise- 05

Spotting (5)-10

ClassrecordandViva–05

ZOO405- Research project- marks 100 [credit – 4]

Candidate has to complete research project in this semester on the topic which was already chosen by him/her in 3rd semester. Research project can be of type dissertation/internship/field survey.

Candidates are evaluated on 100 marks consisting 4 credits.

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