

S. Y. B. Sc. Zoology POs and COs as Per NEP - 2020

❖ Program outcomes (POs):

The curriculum is designed after a long thinking and interacting process with various components of the stakeholders. After successful completion of B. Sc. Zoology Major program students will be able to gain the basic, applied and research-based knowledge pertaining to the various branches of Animal sciences.

1. Knowledge and skills on the topic :

- i. In-depth knowledge of the major concepts, theoretical principles and experimental skills of zoology and its various fields, including biodiversity, anatomy, physiology, biochemistry, bio-nanotechnology, ecology, evolutionary biology, cell biology, molecular biology, immunology, genetics, as well as some other areas of applied research such as wildlife conservation and management, beekeeping, sericulture, vermiculture, neuroscience, aquatic biology, fisheries science, animal breeding, bioinformatics and research methodology, etc.
- ii. Interdisciplinary knowledge of life sciences, environmental sciences, and related biochemical sciences.
- iii. Learn about the various techniques, tools, and computer software used to analyze the forms and functions of animals.

2. Skillful communication : Ability to communicate complex zoological information effectively and efficiently.

3. Critical thinking and problem-solving skills : The ability to rationally analyze and solve animal science issues without relying on hypotheses and guesswork.

4. Logical thinking and reasoning : Ability to search for solutions and solve them logically by experimenting and processing the data manually or by using software.

5. Team spirit and leadership qualities : Ability to identify and mobilize the resources required for the project and management of the project responsibly while adhering to ethical scientific concern and bio-safety protocols.

6. Digital efficiency : Ability to use computers and other tools for biological simulations, calculations, appropriate bio-statistical software, and research tools to locate, retrieve, and evaluate zoology-related data.

7. Ethical awareness and reasoning : Avoid unethical behaviour such as data falsification, forgery or deception, plagiarism and value environmental and sustainability issues.

8. Lifelong learning : Capable of independent, self-directed learning with the aim of personal and social development.

9. Entrepreneurship qualities : Develop entrepreneurship qualities as this course contains

almost all branches of applied zoology. One can establish a start-up project by learning various courses.

10. Advanced education : Students will be able to develop their mind with some advanced and superior knowledge, research outcomes and also the new as well as easy system of education. This will make them more reliable and capable in the world to lead the nation.

❖ **Program Specific Outcomes (PSOs) :**

PSO 1 : After completion of this course students will be able to contribute as policy makers in biodiversity conservation, animal preservation and environment protection.

PSO 2 : Equip with the knowledge of animal classification and diversity, ecology and economic importance of animals.

PSO 3 : Acquire the advanced concepts in insect rearing and various animal breedings for the food security of human beings.

PSO 4 : Inculcate the traditional knowledge of using various animal based products in human healthcare system.

PSO 5 : Adapt scientific research techniques in various applied branches of Zoology for sustainable development.

PSO 6 : Perform procedures as per laboratory standards in the areas of Taxonomy, Physiology, Ecology, Cell biology, Genetics, Applied Zoology, Toxicology, Entomology, Sericulture, Biochemistry, Fish biology, Animal breeding and Clinical Pathology.

PSO 7 : Zoology course also provides a knowledge of applied subjects to develop various skills to make a career and become an entrepreneur in the field of aquatic biology, sericulture, apiculture, vermiculture, prawn culture, dairy management, animal breeding and management, wildlife conservation and management, wildlife photography etc.

PSO 8 : Analyze the relationships among animals, plants, and microbes.

PSO 9 : Understand and analyze the ecological and evolutionary significance of different taxa of animals.

PSO 10 : Analyze the mechanisms involved in life processes up to the molecular level.

PSO 11 : Gains knowledge about research methodologies, effective communication and skills of problem-solving methods.

PSO 12 : Contributes the knowledge for Nation building.

ZOO - 201 - MJ : Public Health and Hygiene (T)

Course Outcomes:

After the completion of the course, students should be able to:

CO1: Understand the fundamental definitions, scope, principles and determinants of public health, and the concept of the Right to be healthy.

CO2: Identify the causes, symptoms, and preventive strategies for major communicable diseases such as malaria, STDs, and rabies.

CO3: Explain the risk factors, symptoms, and prevention methods for common non-communicable diseases like heart disease, asthma, diabetes, cancer, and mental health disorders.

CO4: Apply the principles and methods of health education in addressing population growth, family health, mental health in children, and substance abuse.

CO5: Evaluate the impact of lifestyle choices such as junk food, digital device overuse, and substance consumption on individual and community health.

CO6: Demonstrate knowledge of various types of hygiene including personal, food, and community hygiene and their role in disease prevention.

CO7: Analyze the relationship between hygiene practices and public health, including the role of sanitation, school hygiene programs, and national cleanliness campaigns.

CO8: Understand the structure and functioning of health administration at different levels and critically assess national and global health initiatives, with special emphasis on the COVID - 19 pandemic responses.

ZOO - 202 - MJ : Invertebrate Zoology - I (T)

Course Outcomes:

After the completion of the course, students should be able to:

CO1: Classify and describe the anatomical, physiological and reproductive features of Protozoa, Porifera, Cnidaria.

CO2: Classify and describe the anatomical, physiological and reproductive features of Platyhelminthes, Aschelminths, and Annelida.

CO3: Understand use of nanoparticles in protozoan infection treatment, use of marine natural products from sponges for anticancer and antimicrobial drugs,

CO4: Learn about recent advances in venom studies, bioluminescence, potential in regenerative medicine.

CO5: Analyze life cycles and adaptations of parasitic species (e.g., *Plasmodium*, *Taenia*, *Wuchereria*) and connect this knowledge to current health challenges.

CO6: Interpret current scientific literature on invertebrate research (regeneration in *Hydra* and *Planaria*, genetic studies in *C. elegans*).

ZOO - 203 - MJP : Practicals in Public Health and Hygiene and Invertebrate Zoology - I (P)

Course Outcomes:

After the completion of the course, students should be able to:

CO1: Learn hygiene practices like personal, menstrual, oral and hand hygiene.

CO2: Gain the knowledge of medically important organisms as transmission vectors for infectious disease.

CO3: Qualitative analysis of carbohydrates, proteins and lipids.

CO4: Identify and classify various invertebrate specimens under study.

CO5: Identify various parasitic invertebrates and study their life cycle.

CO6: Understand the detailed study of life cycle of earthworm.

ZOO - 241 - MN : Modern Zoological Techniques and Instrumentation - I (T)

Course Outcomes :

After the completion of the course, students should be able to :

CO1: Describe Zoological laboratory safety protocols, biosafety levels, and biological waste disposal methods.

CO2: Explain the principles and significance of good laboratory practices (GLP) in Zoological dissection and research.

CO3: Demonstrate the use of laboratory instruments such as balances, pipettes, microscopes, and prepare Zoological solutions including buffers and fixatives.

CO4: Calculate concentration units (molarity, normality) and apply them to prepare reagents for Zoological applications.

CO5: Perform colorimetric estimation of biological compounds like hemoglobin and proteins, and interpret their relevance in nutritional and veterinary contexts.

CO6: Carry out simple paper chromatography to separate pigments or amino acids and analyze their applications in forensic and Zoology related toxicology.

ZOO - 242 - MN : Amazing World of Invertebrates – I (T)

Course Outcomes:

After the completion of the course, students should be able to:

CO1: Explain key concepts and levels of taxonomy and systematics, including various modern approaches such as Alpha, Beta, and Gamma taxonomy.

CO2: Apply principles of binomial nomenclature and taxonomic hierarchy to classify organisms accurately up to species level.

CO3: Differentiate between the characteristics of unicellular and multicellular animals,

highlighting the evolutionary significance of Metazoa.

CO4: Describe structural and functional adaptations in Protozoans, with emphasis on locomotion, reproduction, and economic importance.

CO5: Classify and compare the major classes of lower invertebrate phyla such as Porifera, Cnidaria, and Platyhelminthes based on morphology and anatomy.

CO6: Interpret polymorphism in Cnidarians and its ecological role in coral reef formation and marine biodiversity.

CO7: Analyze parasitic adaptations in flatworms and discuss their impact on human and animal health.

CO8: Develop skills in identifying and describing key diagnostic features of lower invertebrates using morphological characteristics and classification keys.

ZOO - 244 - MNP : Practicals in Amazing world of Invertebrates - I (P)

Course Outcomes:

After the completion of the course, students should be able to:

CO1: Identify and describe key diagnostic features of protozoans such as *Amoeba*, *Paramecium*, *Euglena*, *Trypanosoma*, and *Plasmodium* using temporary or permanent slides.

CO2: Demonstrate an understanding of locomotion in protozoans by observing and differentiating between flagella, cilia, and pseudopodia.

CO3: Analyze and label the anatomical features of *Paramecium caudatum*, including food vacuoles, contractile vacuoles, and oral groove through slides or models.

CO4: Prepare and examine temporary mounts of sponge spicules and interpret the canal systems (ascon, sycon, leucon) using charts or models.

CO5: Classify and compare selected sponges (*Sycon*, *Spongilla*, *Euplectella*, *Hyalonema*) up to class level based on morphological features.

CO6: Explain polymorphism in cnidarians through identification of zooid types (gastrozooids, gonozooids, dactylozooids) using diagrams or models.

CO7: Evaluate the structure, types, and ecological significance of corals and coral reefs through specimens, images, or models.

CO8: Examine parasitic flatworms (*Fasciola*, *Taenia*, *Echinococcus*) and describe their adaptations and life cycles using preserved specimens and life cycle charts, understand biodiversity through visits to Zoological institutions.

ZOO - 221 - MJP : Practicals in Medical Laboratory Techniques - I (P)

Course Outcomes :

After the completion of the course, students should be able to :

CO1: Perform routine urine analysis using dipstick methods to detect glucose, proteins, and ketones, and interpret findings relevant to metabolic and renal health.

CO2: Understand and apply protocols for blood compatibility testing, safe blood storage, labelling, and the use of anticoagulants in transfusion practices.

CO3: Prepare and examine KOH mounts for detection of fungal infections in skin, hair, or nails, identifying dermatophytes under the microscope.

CO4: Determine bleeding time and clotting time to assess basic haemostatic function and understand their clinical implications.

CO5: Accurately measure ESR, haemoglobin levels, pulse rate, and respiratory rate, and relate these parameters to general health conditions.

CO6: Prepare and stain peripheral blood smears to identify blood cell morphology and perform basic haematological evaluations.

CO7: Use and interpret results from diagnostic tools such as ECG, rapid diagnostic kits (malaria, HIV), and ELISA to evaluate infectious and non-infectious diseases.

CO8: Develop observational and reporting skills through a mandatory visit to a diagnostic / pathology / blood bank / hospital laboratory and submit a detailed report.

CO8: Assess the economic potential of pearl culture through market-oriented strategies and practical exposure via compulsory visits to pearl farms or natural habitats.

ZOO - 231 - FP : Field Project (P)

Course Outcomes:

After the completion of the course, students should be able to:

CO1: Identify and classify local fauna using standard field techniques and taxonomic keys.

CO2: Develop skills in ecological data collection methods such as quadrat sampling, transect walk, and direct / indirect animal observations.

CO3: Analyze field data using basic statistical tools to draw meaningful biological inferences.

CO4: Prepare and present scientific field reports using standard formats including observations, methodology, and conclusions.

CO5: Demonstrate awareness of biodiversity conservation practices and the ecological importance of local habitats.

CO6: Collaborate effectively in team-based field activities, showing responsibility and ethical behaviour in field work.

CO7: Apply knowledge of animal behaviour, adaptations, and habitat preferences through first hand field observation.

CO8: Utilize digital tools like camera, GPS, field apps and maintain field diaries for documentation and mapping of biodiversity.

OE - 201 - ZOO - T : Sericulture Practices and Management (T)

Course Outcomes:

After the completion of the course, students should be able to:

CO1: Identify and differentiate between major silk-producing moths - Mulberry, Tassar, Eri, and Muga, based on their morphology and silk characteristics.

CO2: Interpret sericulture maps of India and the world, and understand regional distribution and climatic suitability for silk production.

CO3: Examine and describe the morphology and developmental stages like egg, larva, pupa, adult moth of the silkworm life cycle through practical observation.

CO4: Diagnose and differentiate common silkworm diseases - protozoan, bacterial, fungal, and viral and recommend basic preventive measures.

CO5: Analyse suitable agro-climatic conditions and cultivation practices for mulberry farming and assess its potential for rural employment and women empowerment.

CO6: Demonstrate practical skills in silkworm rearing including setup of rearing houses, handling of appliances, and care for early and late-age larvae.

CO7: Perform post-harvest techniques such as stiffling, sorting, cooking, and reeling of cocoons and evaluate their role in silk quality enhancement.

CO8: Assess the economic aspects of sericulture, including cocoon and silk marketing, reeling technologies, and the viability of sericulture as a rural industry.

ZOO – 200 - IKS: Treasures of Animal Kingdom (T)

Course Outcomes:

After completion of the course, students should be able to:

CO1: Understand the historical roots of Indian Zoological traditions by studying the contributions of ancient scholars such as Shalihotra, Palakapya, Bhoja, Paramar, and Hamsadev.

CO2: Trace the evolution of animal conservation ethics from the prehistoric period through the Indus Valley civilization to the Mauryan Dynasty, including references from Vedic texts.

CO3: Critically evaluate human-wildlife interactions through time, with a focus on animal exploitation for sport during the Mughal and colonial periods.

CO4: Identify and describe the major ecological zones of India, including their geographical

distribution, key features, and endemic wildlife species.

CO5: Analyze the impact of colonial hunting practices on biodiversity conservation and understand how these practices influenced post-independence conservation policies.

CO6: Appraise the contributions of Indian naturalists such as Dr. Salim Ali and Dr. Sunder Lal Hora, including the significance of the Satpura Hypothesis in Indian biogeography.

CO7: Discuss the roles and research functions of major Indian institutions like the Wildlife Institute of India and Zoological Survey of India, including their organizational structures and regional branches.

CO8: Interpret the provisions of the Wildlife Protection Act, 1972, including the categorization of animals under various schedules, and explain the significance of Indian natural history museums in biodiversity education.

SEMESTER - IV

ZOO - 251 – MJ : Ecology (T)

Course Outcomes:

After the completion of the course, students should be able to:

CO1: Define ecology, its types, and levels of ecological organization from individual organisms to the biosphere.

CO2: Describe ecosystems, functions of ecosystems, food chains, food webs, energy flow and ecological pyramids.

CO3: Evaluate the role of density-dependent and independent factors in regulating population size.

CO4: Analyze the factors affecting population growth.

CO5: Explain the key characteristics of communities, such as species richness, diversity, and abundance.

CO6: Classify examples of protooperation, mutualism, commensalism, parasitism, and predation in natural ecosystems.

ZOO - 252 - MJ : Invertebrate Zoology - II (T)

Course Outcomes:

After the completion of the course, students should be able to:

CO1: Understand the diversity and characteristics of phylum Aschelminths and Annelida.

CO2: Classify and explain the structure and function of different groups within phylum Arthropoda.

CO3: Gain knowledge about phylum Mollusca and its relevance.

CO4: Analyze the features and classification of phylum Echinodermata.

CO5: Learn about life cycle of earthworm, cockroach and starfish.

CO6: Develop classification and comparative skills across multiple invertebrate phyla.

ZOO – 253 - MJP: Practicals in Ecology and Invertebrate Zoology - II (P)

Course Outcomes:

After the completion of the course, students should be able to:

CO1: Learn about the estimation of DO, CO₂, water holding capacity of soil through experiments.

CO2: Demonstrate understanding of the ecological roles and social behavior of insects, including bees and termites.

CO3: Develop practical competencies in the observation, documentation, and comparative study of invertebrate diversity.

CO4: Identify and describe key morphological features of Aschelminths, Annelida, Arthropoda, Mollusca and Echinodermata using preserved specimens.

CO5: Acquire skills in rearing and managing earthworms, highlighting their environmental

and agricultural importance.

CO6: Illustrate the anatomy and physiology of starfish with a focus on its digestive and water vascular systems.

ZOO - 292 - MN : Amazing World of Invertebrates - II (T)

Course Outcomes:

After the completion of the course, students should be able to:

CO1: Describe and classify major invertebrate phyla including Nematoda, Annelida, Arthropoda, Mollusca, and Echinodermata.

CO2: Identify diagnostic features and representative organisms of each phylum.

CO3: Explain ecological roles and economic importance of selected invertebrates.

CO4: Illustrate adaptive features like segmentation, mouthparts, locomotion, and parasitism.

CO5: Analyze life processes such as reproduction, digestion, and locomotion in key invertebrate models.

CO6: Compare morphological and functional characteristics across phyla.

CO7: Interpret structural adaptations in parasitic and free-living invertebrates.

CO8: Demonstrate practical skills in specimen observation, slide identification, and interpretation of biological models.

ZOO - 294 - MNP: Practicals in Amazing World of Invertebrates – II (P)

Course Outcomes :

After the completion of the course, students should be able to :

CO1: Identify and describe morphological and anatomical features of *Ascaris lumbricoides* and *Wuchereria bancrofti*, recognizing their adaptations for parasitism.

CO2: Demonstrate the ability to observe and label external features of *Pheretima posthuma* using preserved specimens or models.

CO3: Analyze the structure and function of parapodia and setae in *Nereis*, relating them to locomotion and habitat adaptation.

CO4: Compare and contrast different insect mouth parts like biting, piercing, lapping through accurate identification using models or diagrams.

CO5: Identify economically important insects and explain their beneficial or harmful role in agriculture, apiculture, or sericulture.

CO6: Classify and distinguish representative arthropod specimens like *Palaemon*, *Crab*, *Julus*, *Scolopendra*, *Periplaneta*, *Buthus*, *Anopheles* based on key morphological traits.

CO7: Recognize and interpret structural features of molluscan shells and echinoderm systems - *Pila*, *Lamellidens*, *Asterias*, including water vascular system and pedicellariae.

CO8: Prepare and submit a field / museum visit report demonstrating the understanding of non-chordate diversity, taxonomy, and ecological relevance through observational learning.

ZOO - 271 - MJP: Practicals in Medical Laboratory Techniques II (P)

Course Outcomes :

After completion of this course, students should be able to:

CO1: Understand and identify the cellular and tissue-level characteristics of acute and chronic inflammation through microscopic examination of prepared slides.

CO2: Prepare and apply standard cytological stains such as Eosin, Methylene Blue, Hematoxylin, and Giemsa, and evaluate their effectiveness in diagnostic applications.

CO3: Demonstrate proficiency in tissue processing and microtomy techniques for the preparation of permanent histological slides.

CO4: Perform and interpret essential hematological procedures including blood cross-matching, bleeding time, and clotting time for transfusion compatibility and bleeding disorders.

CO5: Recognize various cytological specimens and understand their diagnostic significance in cytopathology and cancer screening.

CO6: Estimate and analyze clinical biochemistry parameters such as total protein, albumin, globulin, liver enzymes (ALT, AST), bilirubin, cholesterol, and triglycerides using standardized assays.

CO7: Culture and identify bacteria using differential media and biochemical tests, and understand their clinical relevance in diagnostic microbiology.

CO8: Describe the principles and procedures of biopsy and autopsy, including the types, techniques, and importance in disease diagnosis and postmortem studies.

OE - 251 – ZOO – P : Practicals in Advanced Sericulture Technology (P)

आधुनिक रेशीम रघु उद्योग (P)

Course Outcomes:

After completion of this course, students should be able to :

CO1: To learn the rearing technique of silkworms for entrepreneurship.

CO2: To learn the complete life cycle of silkworm in practice.

CO3: To learn different types of diseases and the causes of diseases in silkworms and take measures accordingly.

CO4: To identify different sericulture products and their outcome.

CO5: Identify the enemies and damages caused by them.

CO6: Understand the sericulture industries across the States in India

CO7: Explore the knowledge about appliances in sericulture.

CO8: Experience the silk farming practices.

ZOO – 281 – CEP : Community Engagement Program (P)

Course Outcomes:

After completion of this course, students should be able to:

CO1: Identify and understand community-level biological and environmental issues such as animal welfare, waste management, or vector-borne diseases.

CO2: Plan and participate in outreach or awareness activities related to biodiversity conservation, zoonotic diseases, or eco-friendly practices.

CO3: Demonstrate ability to communicate Zoological knowledge to non-scientific audiences through charts, talks, street plays, or demonstrations.

CO4: Engage with local communities, ethically and respectfully while gathering or sharing biological and environmental data.

CO5: Apply Zoological concepts in designing small-scale community solutions, e.g. compost pits, bird feeders, mosquito control.

CO6: Reflect on personal growth and social responsibility through self-assessment, diaries, or community feedback.

CO7: Work collaboratively in team-based service-learning projects and manage roles effectively.

CO8: Document and present community service outcomes in the form of reports, presentations, or exhibitions.

SEC - 251 - ZOO: Practicals in Sericulture (P)

Course Outcomes:

After completion of this course, students should be able to:

CO1: To learn the rearing technique of silkworms for entrepreneurship.

CO2: To learn the complete life cycle of silkworm in practice.

CO3: To learn different types of diseases and the causes of diseases in silkworms and take measures accordingly.

CO4: To Identify different sericulture products and their outcome.

CO5: Identify the enemies and damages caused by them.

CO6: Understand the sericulture industries across the States in India

CO7: Explore the knowledge about appliances in sericulture.

CO8: Experience the silk farming practices.