

Hukum Singh Bora Govt. Post Graduate College, Someshwar (Almora)

B.Sc. Zoology

Course Objective (CO):

- The programme in Zoology aims to equip students with recent advances in Zoology from organismic to reductionist biology.
- It also aims to empower students to understand the challenges of society and the country that falls into the realms of Zoology, such as Aquaculture, Reproductive health, Behavior and Biological time keeping, Cancer Biology, Microbiome and their in health and disease.
- Bioremediation of pollutants and pesticides, etc.
- It also offers students to a series of elective courses so that they can choose to specialize in the specific area of their interests in Zoology.
- The open elective has been chosen to attract students from diverse interdisciplinary areas of sciences, such as Anthropology, Environmental studies, Biomedical Sciences, etc.
- This course is designed to ignite the inquisitive mind to enter in to research in
- It is expected that a student after successfully completing the programme would sufficiently be skilled and empowered to solve the problems in the realms of Zoology and its allied areas.
- They would have plethora of job opportunities in the education, environment, agriculture based, and health related sectors.
- The bright and ignited mind may enter into research in the contemporary areas of Zoological/Biological Sciences.
- The broad skills and the deeper knowledge in the field would make them highly successful and excellent researcher in advanced areas of research in the Biological sciences.

Semester I course outcome

(Paper 1- lower non chordate)

1. Students will learn about the basic taxonomy , systematics and classification of Protozoa, Porifera, and Coelenterata, Helminthes groups.
2. They also acquire knowledge about the biology of these taxonomic Categories as well as about some acelomate and pseudocoelomate, Parasites for their life cycles, epidemiology, pathology, diagnosis, symptoms and treatments of the disease.
3. They will know about the basics of parasitology such as origin and evolution of parasitism, role of vectors, parasitoids, host-parasite interactions etc.
4. They will understand evolutionary history and relationships of different non-Chordates through functional and structural affinities.
5. They will be able to critically analyze organization, complexity and characteristic features of non-Chordates along with their significance and interactions with the environment.
6. The paper of Non-chordates will help them to enhance their collaborative learning and communication skills through discussions in the class group.
7. Discuss the animal architecture and function during the course of evolution
8. Create the awareness of the economic importance and significance of invertebrates

Hukum Singh Bora Govt. Post Graduate College, Someshwar (Almora)

9. They also have knowledge about coral and coral reef

Paper II: Higher Non-Chordata

1. Students will learn about phylum Arthropoda, Annelida, Mollusca, Echinodermata.
2. They will be able to identify the pollinator and bioindicators species of Class Insecta.
3. They will also know about the role of earthworm in increasing the fertility of soil.

Paper III: Cell Biology

1. Illustrate that Cell being the fundamental structural unit that defines the function of all living things.
2. They Obtain knowledge of the structures and functions of basic components of prokaryotic and eukaryotic cells, especially macromolecules, role of plasma membranes, and organelles.
3. Understand the cellular components underlying cell division.
4. Compare and contrast the events of cell cycle and its regulation.
5. Explain the communications of cells with other cells and to the environment.
6. They know how ATP is produced by mitochondria.
7. They will be able to answer which organelle performs which function.
8. They can differentiate between germ cell, somatic cell, mitosis, meiosis.
9. They get knowledge about structure and role of chromosome.

Semester-I, Practical

1. They will be able to identify different animal phylum by observing animal specimen.
2. They obtain knowledge how to prepare slides and how to study them under microscope.

Suggested books:

1. P.K. GUPTA, Cell Biology and Genetics P.K. GUPTA,
2. Hyman L: Kotpal R.L: Modern Textbook Of Zoology : Invertebrates. Rastogi
3. Barnes: Invertebrate Zoology (4th ed.), Holt- Saunders, 1980.

Semester- II course outcome

Paper I - Molecular Biology, Elementary Biotechnology and Biological Techniques

1. On completion of this course, the students will be able to describe the basic structure of nucleic acids at the molecular level and with a deeper understanding of the structure of DNA students will be able to explain how RNA differs from DNA.

Hukum Singh Bora Govt. Post Graduate College, Someshwar (Almora)

2. Learn how the DNA is packaged inside the nucleus in association with the histone proteins and organized in a genome.
3. Explain the underpinnings of the mechanism of DNA replication and repair and will be able to compare and contrast eukaryotic and prokaryotic enzymes involved in DNA replication and repair.
4. Explain the interrelationship of DNA, RNA and protein synthesis and how these interactions are regulated.
5. Demonstrate the profound understanding of the process of transcription, including the three major steps of initiation, elongation, and termination and how this process is both similar and different in prokaryotic and eukaryotic organisms.
6. Understand the characteristics of genetic code,
7. Be able to explain how mRNAs, rRNAs and tRNAs are synthesized and processed.
8. Students understand the concept of Restriction enzymes and cloning techniques used in recombinant DNA technology, students know the concept of DNA fingerprinting and how DNA fingerprinting technique is used to find the criminal
9. Students were able to perform experiments of Photometry, Chromatography, Electrophoresis and Microscopy.

Paper II: Taxonomy, Evolution and Elementary Palaeontology

1. After completion of the course students will be able to understand different taxa (categories).
1. They understand the concept of Binomial and Trinomial nomenclature,
2. Student are able to understand the fundamental principles of systematic in which the animals are classify according to their characters and what are the theories which have to followed for classification is studied. International rules of nomenclature and classification is studied
3. They will understand the concept of species.
4. Students will know about human evolution,
5. Various concepts about origin of species, extinctions, phylogenetic tree making.
They understand different theories of evolution Lamarckism, Darwinism, Synthetic theory of evolution.
6. They are able to understand Geological time scale and they can calculate the age of fossil.

Paper III: Genetics

1. On completion of the course students will gain a basic understanding on human genetics and hereditary.
2. They learn about DNA, RNA and their replication, mutation, DNA repair mechanism.
3. Students learn about transgenic animal, their application in pharmaceutical industry, cloning and its importance.

Semester-II, Practical

1. Students will be able to perform experiments on Mendelian and non- Mendelian inheritance.

Hukum Singh Bora Govt. Post Graduate College, Someshwar (Almora)

2. They will be able to handle different instruments related to experiments.
3. They will be able to collect insects by using different collecting tools.

Suggested books:

- Lodish-el al, Molecular Biology
- Molecular Cell Biology, Lodish et al., W.H. Freeman and Company, New York, USA.
- Molecular Biology of the Cell, Alberts et al., Garland Science, Taylor and Francis Group, New York, USA.
- Strickberger: Genetics, Prentice hall
- Principles of Genetics, Snustad and Simmons, John Wiley & Sons, USA

III Semester course outcome

Paper I: Lower Chordata

1. On completion of the course Students will understand the classification, structure, function and biology of chordates of different taxonomic classes.
2. Parental care of amphibian and fishes.

Paper II: Higher Chordata

1. On completion of the course students are able to identify and differentiate between poisonous and non poisonous snakes.
2. They will know the concept of migration of birds.
3. They will know about the concept of flight in birds and flight adaptation in birds.

Paper III: Ecology and Environmental Biology

1. On completion of the course Students will understand the various features and aspects of population ecology, community ecology and ecosystem ecology. They might have the knowledge about environmental biology in details
2. Students will know the concept of Energy flow in ecosystem. Pyramids of number, biomass and energy. Food chain- grazing and detritus, Food web and trophic levels
3. They will be able to relate abiotic factors with biotic factors.
4. They understand the concept of protected areas- Sanctuary, National Parks and Biosphere Reserves.
5. They will be able to answer on the following topics: Ozone layer depletion, Bio-accumulation, Biomagnifications

Semester III Practical:

1. They will be able to perform experiments to determine pH of water/soil
2. They are able to determine dissolved oxygen and carbon dioxide in water sample.

Hukum Singh Bora Govt. Post Graduate College, Someshwar (Almora)

3. They will be able to identify the animal with the help of specimen.
4. They gain knowledge about how to prepare practical file.

Suggest books:

- Chordate zoology by E.L Jordan
- Modern Textbook Of Zoology Vertebrates by R.L. Kotpal.
- Fundamental of ecology by P.Odum.
- Ecology and Environment by P.D Sharma.

Semester-IV course outcome

Paper I: Developmental Biology

1. On completion of the course Students will learn the different aspects of early, late and postembryonic developments. They will have the knowledge about implications of developmental biology in various fields.
2. They will know stem cell biology, in vitro fertilization, cryopreservation, cord blood transfusion.
3. They will know the concept of gametes formation.
4. They understand the process of regeneration.
5. This course will help the students to understand the development of multicellular organisms from a single cell zygote.
6. Students will be able to appreciate the mechanisms that support growth and development.
7. They will learn interesting and unique post embryonic development that happens in other animals

Paper II: Applied Zoology

1. After completion of the course students will gain knowledge of Aquaculture, Sericulture, Apiculture, Lac culture, Pearl culture, Piggery.
2. They will know about the pest of fruit, vegetables, stored grains.
3. They will know the concept of integrated pest management.

Paper III: Elementary Entomology and Applied Ichthyology

1. On completion of course students will be able to classify insects and fishes.
2. They are able to collect and preserve insects for their study
3. They will know the concept of Induced breeding and Indigenous and exotic fishes.

Hukum Singh Bora Govt. Post Graduate College, Someshwar (Almora)

Semester-IV, Practical

1. They will be able to prepare and study slides.
2. They will gain knowledge about collection of insects.

Suggest books:

- Development biology by Michael J. Barresi, Scott F. Gilbert.
- Wolpert: Analysis of Biological development, Oxford.
- Kolthoff, Analysis of Biological development, McGraw- Hill Science, New Delhi, India.
- The Insects (structure and Function) by R.F. Chapman
- Applied and Economic Zoology by Shukla, Upadhyay.

Semester-V course outcome

Paper I: Microbiology

1. On completion of course students will understand the structure of a bacterium.
2. And they can differentiate between Gram positive and Gram negative bacteria.
3. They will know the structure and life cycle of virus.
4. They will have knowledge about Bacteriophages, Mycobacterium, Rickettsia, Actinomycetes and Mycoplasma.
5. They will get a brief knowledge of AIDS
6. They understand Food production, dairy products, fermented food, alcoholic beverages, microbial spoilage and food preservation. A brief knowledge of Antibiotics.

Paper II: Animal Behaviour

1. Students will know in details about patterns of behaviours, survival strategies, social and cooperative behaviours
2. They understand the communication concept.
3. They will know the dancing language of honey bee used for communication

Paper III: Toxicology and Histology.

1. On completion of course students know about toxic agents- animal toxins, plant toxins, pesticides, metals and food additives. Metabolism of toxic substances.
2. It gives them a definite idea not only the structure but also the structural development of that organ and how they become modified according to their need and environment.
3. They will gain knowledge about tissue and they are able to differentiate between bone and cartilage.

Semester-V, Practical

Hukum Singh Bora Govt. Post Graduate College, Someshwar (Almora)

1. Students will gain knowledge about cleaning and sterilizing glassware.
2. They will be able to prepare the media for cultivation of bacteria
3. They gain knowledge about staining technique.
4. They will be able to calculate the LC₅₀

Suggest books:

- Mechanism of Animal Behaviour Peter Marlar & J. Hamilton.
- Animal Behaviour by David McFarland.
- Animal Behaviour John Alcock
- Pelczar Microbiology
- Davies Microbiology
- “Casarett & Doull’s Essentials of Toxicology”, 2nd Ed. Edited by Curtis A. Klaassen & John B. Watkins III, published by McGraw Hill-Lange
- “Handbook of Toxicology”, M.J.Derelanko & C.S.Auletta, 3rd Ed. CRC Press
- Principles of Biochemical Toxicology” by J.A.Timbrell

Semester-VI course outcome

Paper I: Biological Chemistry and Basic Mammalian Endocrinology

1. Students will understand the basic and fundamental biochemistry of carbohydrates, proteins, lipids and nucleic acids. They will also understand the nature, mechanism, and kinetics of enzyme action.
2. All the biochemical components of the body system are studied. It helps the student to get a view about the chemical compositions of different chemical compounds such as enzymes, hormones and other secretions. It also includes the pathway and chemical which are responsible for the energy production in our body.
3. It gives an idea about the glands which works inside the body and secretes a chemical called hormone. How it is classified, how it works and the regulation of these hormones . It give a clear picture of its function.
4. They also know about the hormonal disorders and related disease.

Paper II: Animal Physiology

1. Students will know the physiology of digestion, respiration, circulation, nervous system, excretion and muscle contraction.
2. Students will be able to know basic fundamentals and understand advanced concepts related to systems in the body, their feedback loop controls.

Hukum Singh Bora Govt. Post Graduate College, Someshwar (Almora)

3. They will be able to understand the connections between knowledge of Physiology in relation to real world situations, including healthy lifestyle decisions, diseases and disorders and homeostatic imbalances.
4. They will be able to know the role of self-sustaining systems like circulatory, digestive, respiratory, nervous, muscular and excretory systems and how all of these work to maintain a balance in the body.

Paper III: Bioinformatics and Biostatistics

1. In this paper students may understand about the quantitative and qualitative results.
2. Statistics used in biology. What are the parameters, the methods of determination are, and how it analyzed.
3. They will gain Elementary knowledge of computer.
4. They will understand the concept of software, hardware and programming language.
5. They will be able to create data base in the computer
6. They will gain knowledge about how data are collected and how it is presented through different methods.
7. They will also know the concept of mean, mode and median.

Semester-VI, Practicals

1. Students will be able to count RBCs and WBCs.
2. They will be able to prepare haemin crystal.
3. They gain knowledge for determining clotting, bleeding time and hemoglobin percentage in human blood.

Suggest books:

- Ganong: Review of Medical Physiology, Lang Medical Publ.
- Guyton and Hall; Textbook of Medical Physiology WB Saunders.
- Keel et al: Sampson Wright's Applied Physiology, Oxford Press.
- C.C. Chatterjee: Human Physiology.
- Nielson: Animal Physiology, Cambridge.
- Jain A.K.: Textbook of Physiology, Avical Publishing Company.
- Conn And Stumpf: Outlines of Biochemistry, John Wiley.
- Introduction to Biostatistics by Dr. Pranab Kr. Banarjee.
- Bioinformatics: Sequence And Genome Analysis by David W. Mount.
- Basic Bioinformatics by S. Ignacimuthu Published by Narosa Publishing House New Delhi.