

# Government Girls' P.G. College, Ghazipur

## Department of Zoology

### Programme Offered: B.Sc. in Zoology

#### 1. Programme Objectives (POs):

1. The students get the flavour of both classical and modern aspects of Zoology/Animal Sciences.
2. The syllabus aims to enable the students to study animal diversity in Indian subcontinent, environmental science and behavioural ecology (i.e. ethology).
3. The students gain the knowledge about the insights and skill from basic to advanced aspects of animal sciences, understands the complex interactions among various living organisms and their significance towards environment. The diverse animals in different phyla, their distribution, behaviour, biology and interaction with the environment.
4. In the cell biology the students gain the knowledge about the insights of structure of cell, its functions and significance in various metabolic functions of organisms.
5. In the genetics the students understand various concepts of genetics and its importance in human health and diseases.
6. In the Evolutionary biology the students gets the knowledge of the complex evolutionary processes and behaviour of animals.
7. The students correlate the physiological processes of animals and relationship of organ systems.
8. Apart from the cell biology, genetics, parasitology, evolutionary biology, molecular biology, biochemistry physiology and biostatistics; the modern disciplines like bioinstrumentation, immunology, gene technology, computational biology, bioinformatics and genetic engineering have been included to ensure the study of animals more interesting and relevant to human studies as required in recent times.
9. The students understand the importance and conservation processes of environment, biodiversity and different ecosystems, pollution control and protection of endangered species.
10. Identify and correlate the science behind natural and physiological processes and their interactions with different components of Ecosystem.
11. The students enriched with the knowledge about physiological adaptations, development, reproduction and behaviour of organisms.
12. The students get information and skill of advanced biological techniques for experimental purpose. The lab courses have been designed in such a manner that students will be trained to join public or private labs.
13. The students gain the knowledge about small scale industries like sericulture, apiculture, aquaculture, poultry etc. in the branches related to applied and economic Zoology.
14. The syllabus applies ethics and principles and commits their responsibilities towards society.
15. It also applies the knowledge and understanding of Zoology to day to day life activities; and develops empathy and love towards the animals.

<b>CERTIFICATE COURSE IN MEDICAL DIAGNOSTICS AND PUBLIC HEALTH</b>	
<b>2 (a). B.Sc. I Programme Specific Outcomes (PSOs):</b>	
<b>PSO1</b>	This course introduces system biology and various functional aspects of an organism. The emphasis will be on physiological understanding of abnormalities and anomalies associated with white bloodcells (WBCs) and red blood cells (RBCs). Course emphasizes the cell identification, cell differentiation and cell morphology evaluation methods. This will enhance hematology analytical skills along with skill of using various instruments.
<b>PSO 2</b>	The students will learn about basic principles of genetics and how to prepare karyotypes to study the chromosomes.
<b>PSO 3</b>	The students will able to gain the knowledge that how chromosomal aberrations are inherited in humans by pedigree analysis in families.
<b>PSO 4</b>	Students will have hands-on training in the techniques like microscopy, centrifugation, chromatography and several biochemical techniques, preparation of slides which will provide employment opportunity in pathology labs and contribute to health care system.
<b>PSO 5</b>	<i>The Certificate courses will enable students to apply for technical positions in government and private labs/institutes etc.</i>
<b>DIPLOMA IN MOLECULAR DIAGNOSTICS AND GENETIC COUNSELLING</b>	
<b>2 (b). B.Sc. Part II Programme Specific Outcomes (PSOs):</b>	
<b>PSO 1</b>	At the completion of the course the students will be able to have a detailed and conceptual knowledge about molecular processes viz. DNA to trait. The differential regulation of genes in prokaryotes and eukaryotes leads to the development of an organism from an embryo.
<b>PSO 2</b>	Students will be able to understand and apply the principles and techniques of molecular biology which prepares students for further career in molecular biology. Independently execute a laboratory experiment using the standard methods and techniques.
<b>PSO 3</b>	Principles of genetic engineering, gene cloning, immunology and related technologies will enable students to play an important role in applications of biotechnology in various fields like agriculture, forensic sciences, industry and human health and make a career out of it. The students can have their own start-ups as well.
<b>PSO 4</b>	Basic tools of bioinformatics will enable students to analyze large amount of the genomic data and its application to evolutionary biology. Apply knowledge and awareness of basic principles and concepts of biology, computer science and mathematics existing software effectively to extract information from large databases and to use this information in computer modeling.
<b>PSO 5</b>	<i>The Diploma courses will ensure employability in Hospitals/Diagnostics and Pathology labs with good hands-on training. It will also enable students to take up higher studies and Research as their career and work in renowned labs in the country and abroad.</i>
<b>DEGREE IN BACHELOR OF SCIENCE</b>	
<b>2 (c). B.Sc. Part III Programme Specific Outcomes (PSOs):</b>	

<b>PSO1</b>	This programme aims to introduce and aware the students to animal diversity of invertebrates and vertebrates. The students will be taught about invertebrates and vertebrates using observational strategies, museum specimens and field reports.
<b>PSO 2</b>	A number of interacting processes generate an organism's heterogeneous shapes, size, and structural features.
<b>PSO 3</b>	The inclusion of ecology and environmental sciences in the syllabus will enrich students with our world which is crucial for human well being and prosperity. This section will provide new knowledge of the interdependence between people and nature that is vital for food production, maintaining clean air and water, and sustaining biodiversity in a changing climate.
<b>PSO 4</b>	Students will also come to know about the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.
<b>PSO 5</b>	Basic concepts of biosystematics, evolutionary biology and biodiversity will enable the students to solve biological problems related to environment.
<b>PSO 6</b>	At the end of the course students will be capable enough to comprehend the reason behind such a huge diversity of animals and reason out why two animals are grouped together or remain separate due to similarities and differences which exist at various levels along with ecological, environmental and cellular inputs.
<b>PSO 7</b>	<i>The Degree courses will enable students to go for higher studies like Masters and Ph.D. in Zoology and Allied subjects.</i>

### 3. Course Outcomes (COs):

Programme/Class	Course	Course Outcomes
Programme/Class: Certificate	Year: First, Semester: First, Subject: Zoology (Cytology, Genetics and Infectious Diseases)	<ul style="list-style-type: none"> <li>• Understand the structure and function of all the cell organelles.</li> <li>• Know about the chromatin structure and its location.</li> <li>• Familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.</li> <li>• How one cell communicates with its neighboring cells?</li> <li>• Understand the basic principles of genetics and how genes (earlier called factors) are inherited from one generation to another.</li> <li>• Learning the theories of classical genetics, genetic variation through linkage and crossing over.</li> <li>• Understand the Mendel's laws and the deviations from conventional patterns of inheritance.</li> <li>• Comprehend how environment plays an important role by interacting with genetic factors.</li> <li>• Chromosomal aberrations and sex determination, gene expression and regulation, genetic disorders and inborn anomalies.</li> <li>• How to detect chromosomal aberrations in humans</li> </ul>

		and study the pattern of inheritance by pedigree analysis in families.
Programme/Class: Certificate	Year: First, Semester: First, Subject: Zoology (Cell Biology and Cytogenetics Lab)	<ul style="list-style-type: none"> <li>• Hands-on use of simple and compound microscopes.</li> <li>• Prepare slides and stain them to see the cell organelles.</li> <li>• Familiar with basic principle of life, how a cell divides and form leading to the growth of an organism and also reproduces to form new organisms.</li> <li>• Chromosomal aberrations by preparing karyotypes.</li> <li>• How chromosomal aberrations are inherited in humans by pedigree analysis in families.</li> <li>• The antigen-antibody reaction.</li> </ul>
Programme/Class: Certificate	Year: First, Semester: Second, Subject: Zoology (Biochemistry and Physiology)	<ul style="list-style-type: none"> <li>• Learn to develop a deep understanding of structure of biomolecules (carbohydrates, lipids, enzymes and proteins etc.).</li> <li>• How simple molecules together form complex macromolecules.</li> <li>• Understand the thermodynamics of enzyme catalyzed reactions.</li> <li>• Mechanisms of energy production at cellular and molecular levels.</li> <li>• Knowledge of basic terms and processes in physiology.</li> <li>• Understand systems biology and various functional components of an organism.</li> <li>• Explore the complex network of these functional components.</li> <li>• Comprehend the regulatory mechanisms for maintenance of function in the body.</li> </ul>
Programme/Class: Certificate	Year: First, Semester: Second, Subject: Zoology (Physiological, Biochemical and Hematology Lab)	<ul style="list-style-type: none"> <li>• Perform basic hematological laboratory testing.</li> <li>• Understand the structure of biomolecules like proteins, lipids and carbohydrates.</li> <li>• Distinguish normal and abnormal hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.</li> </ul>
Programme/Class: Diploma	Year: Second, Semester: Third, Subject: Zoology (Molecular Biology, Bioinstrumentation)	<ul style="list-style-type: none"> <li>• A detailed and conceptual understanding of molecular processes <i>viz.</i> DNA to trait.</li> <li>• A clear understanding of the processes of central dogma <i>viz.</i> transcription, translation <i>etc.</i> underlying survival and propagation of life at molecular level.</li> <li>• Understanding of how genes are ultimately</li> </ul>

	and Biotechniques)	<p>expressed as proteins which are responsible for the structure and function of all organisms.</p> <ul style="list-style-type: none"> <li>• Learn how four sequences (3 letter codons) generate the transcripts of life and determine the phenotypes of organisms.</li> <li>• How genes are regulated differently at different time and place in prokaryotes and eukaryotes.</li> </ul>
Programme/Class: Diploma	Year: Second, Semester: Third, Subject: Zoology (Bioinstrumentation and Molecular Biology Lab)	<ul style="list-style-type: none"> <li>• Understand the basic principles of microscopy, working of different types of microscopes.</li> <li>• Understand the basic techniques of centrifugation and chromatography for studying cells and separation of biomolecules.</li> <li>• Understand the principle of measuring the concentrations of macromolecules in solutions by colorimeter and spectrophotometer and use them in Biochemistry.</li> <li>• Learn about some of the commonly used advanced DNA testing methods.</li> </ul>
Programme/Class: Diploma	Year: Second, Semester: Fourth, Subject: Zoology (Gene Technology, Immunology and Computational Biology)	<ul style="list-style-type: none"> <li>• Understand the principles of genetic engineering, how genes can be cloned in bacteria and the various technologies involved in it.</li> <li>• Know the applications of biotechnology in various fields like agriculture, industry and human health.</li> <li>• Get introduced to DNA testing and utility of genetic engineering in forensic sciences.</li> <li>• Students have an in depth understanding about Immune System and its mechanisms.</li> <li>• Knowledge of tissues, cells and molecules involved in host defense mechanisms; Understanding of types of immunity; Interactions of antigens, antibodies, complements and other immune components; Understanding of immune mechanisms in disease control, vaccination, process of immune interactions.</li> <li>• Get introduced to computers and use of bioinformatics tools.</li> <li>• Understanding working and principles of histochemical techniques; learning the concepts of Bioinformatics and their utilization in applicable fields.</li> <li>• Differentiate between the Quantitative and Qualitative Research; understand the various techniques of Data Collection, Observation, various types of Sampling, Data Processing and Analysis.</li> </ul>

		<ul style="list-style-type: none"> <li>• Enable students to get employment in pathology/ Hospital.</li> <li>• Take up research in biological sciences.</li> </ul>
Programme/Class: Diploma	Year: Second, Semester: Fourth, Subject: Zoology (Genetic Engineering and Counselling Lab)	<ul style="list-style-type: none"> <li>• Understand the principles of genetic engineering with hands-on experiments in mutation detection, testing of infectious diseases like Covid 19.</li> <li>• Get introduced to DNA testing and utility of genetic engineering in forensic sciences.</li> <li>• Apply knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics existing software effectively to extract information from large databases and to use this information in computer modeling.</li> <li>• Use bioinformatics tools to find out evolutionary/ phylogenetic relationship of organisms using gene sequences.</li> <li>• Get employment in Hospitals/Diagnostic and forensic labs/Counsel families with genetic disorders.</li> <li>• Enable students to take up research in biological sciences.</li> </ul>
Programme/Class: Degree	Year: Third, Sem: Fifth, Subject: Zoology (Diversity of Non-Chordates and Economic Zoology)	<ul style="list-style-type: none"> <li>• Demonstrate comprehensive identification abilities of non-chordate diversity</li> <li>• Explain structural and functional diversity of non-chordate</li> <li>• Explain evolutionary relationship amongst non-chordate groups</li> <li>• Get employment in different applied sectors</li> <li>• Students can start their own business i.e. self employments.</li> <li>• Enable students to take up research in Biological Science</li> </ul>
Programme/Class: Degree	Year: Third, Semester: Fifth, Subject: Zoology (Diversity of Chordates and Comparative Anatomy)	<ul style="list-style-type: none"> <li>• Students learn basic concepts of classifying Chordates.</li> <li>• Identify the taxonomic hierarchy of the entire chordate phyla from protochordata to higher vertebrata.</li> <li>• Demonstrate comprehensive identification abilities of chordate diversity.</li> <li>• Explain structural and functional diversity of chordates.</li> <li>• Understand basic behaviour, biology and anatomy of some important organisms, correlate their existence</li> </ul>

		<p>with other higher organisms and evaluate their economic importance.</p> <ul style="list-style-type: none"> <li>• Explain evolutionary relationship amongst chordates.</li> <li>• Take up research in biological sciences.</li> </ul>
Programme/Class: Degree	Year: Third, Semester: Fifth, Subject: Zoology (Lab on Virtual Dissection, Anatomy, Economic Zoology and Parasitology)	<ul style="list-style-type: none"> <li>• Demonstrate comprehensive identification abilities of chordate and non- chordates diversity.</li> <li>• Explain structural and functional diversity of chordates and non-chordates.</li> <li>• Explain evolutionary relationship amongst chordates and non- chordates.</li> <li>• Learn about some important parasites, vector and pests of economic importance.</li> <li>• Tools and techniques used in Pisciculture, Apiculture, Sericulture, Lac culture, and Vermiculture.</li> <li>• Generate self employment.</li> <li>• Enable students to take up research in biological sciences.</li> </ul>
Programme/Class: Degree	Year: Third, Semester: Sixth, Subject: Zoology (Evolutionary and Developmental Biology)	<ul style="list-style-type: none"> <li>• Basic understanding of origin of earth, life and living beings in regards to various theories proposed for origin of life and extra-terrestrial life.</li> <li>• Understand that by biological evolution we mean that many of the organisms that inhabit the earth today are different from those that inhabited it in the past.</li> <li>• Understood the theories of evolution and highlighted the role of evidences in support of evolution.</li> <li>• Describe the concept of organic evolution and origin of life.</li> <li>• Understand that natural selection is one of several processes that can bring about evolution, although it can also promote stability rather than change.</li> <li>• Understand the concept and process of formation and development of gamete and embryo, organogenesis, extra embryonic membranes and placenta.</li> <li>• Understand how the single cell formed at fertilization forms an embryo and then a full adult organism.</li> <li>• Integrate genetics, molecular biology, biochemistry, cell biology, anatomy and physiology during embryonic development.</li> <li>• Understand a variety of interacting processes, which</li> </ul>

		<p>generate an organism's heterogeneous shapes, size, and structural features.</p> <ul style="list-style-type: none"> <li>• Understand how a cell behaves in response to an autonomous determinant or an external signal, and the scientific reasoning exhibited in experimental life science.</li> </ul>
Programme/Class: Degree	Year: Third, Semester: Sixth, Subject: Zoology (Ecology, Ethology, Environmental Science and Wildlife)	<ul style="list-style-type: none"> <li>• Complexities and interconnectedness of various environmental levels and their functioning.</li> <li>• Global environmental issues, their causes, consequences and amelioration.</li> <li>• Understand and identify behaviours in a variety of taxa.</li> <li>• The proximate and ultimate causes of various behaviours.</li> <li>• About the molecules, cells, and systems of biological timing systems.</li> <li>• Conceptualizing how species profitably inhabit in the temporal environment and space out their activities at different times of the day and seasons.</li> <li>• Interpret the cause and effect of lifestyle disorders contributing to public understanding of biological timing.</li> <li>• Understand the importance of wildlife, biodiversity and their conservation.</li> </ul>
Programme/Class: Degree	Year: Third, Semester: Sixth, Subject: Zoology (Lab on Ecology, Environmental Science, Behavioural Ecology, and Wildlife)	<ul style="list-style-type: none"> <li>• Understand the basic concepts, importance, status and interaction between organisms and environment.</li> <li>• Observe the models of wild animals specially the threatened one to develop a sense to inculcate the measures of their conservation.</li> <li>• Get employment in forest services, sanctuaries, conservatories etc.</li> <li>• Enable students to take up research in wildlife.</li> </ul>