DURGAPUR GOVERNMENT COLLEGE
DEPARTMENT OF ZOOLOGY
PROGRAMME OUTCOME, COURSE OUTCOME AND PROGRAM SPECIFIC OUTCOME

Aims of the Bachelors' Degree Program in Zoology [As per the UGC LOCF Template (2019)]

Zoology is the study of all animal life; from primitive microscopic malaria-causing protozoa to large advanced mammals, across all environmental spheres from red deer in mountain forests to dolphins in deep oceans, and from underground burrowing voles to golden eagles in the skies. Some of these animals are useful to us and we nurture them as pets or livestock; some are serious pests or disease-causing; and some are simply splendid and awe-inspiring. No matter what our relation with the animals is, we need to understand their behaviour, population dynamics, physiology and the way they interact with other species and their environments.

1. To provide students with the knowledge and skill base that would enable them to undertake further studies in Zoology and relatedareas or in multidisciplinary areas.
2. To develop a range of generic skills that are relevant to wage employment, self-employment and entrepreneurship.
3. To enhance the skills required to perform research in laboratory and experimental research.
4. To make specialists in immunology, ornithology, animal behaviour or entomology
5. To demonstrate a fundamental/systematic or coherent understanding of the academic field of Zoology, its different learning areas and applications, and its linkages with related disciplinary areas/subjects.
6. To acquire procedural knowledge that creates different types of professionals related to Zoology area of study, including research and development, teaching and government and public services.
7. To enhance the skills in areas related to specialization area relating the subfields and current developments in the academic field of Zoology and use their knowledge, understanding and skills to identify the problems and issues relating to Zoology.
8. To develop a keen interest in research and the study of living organisms and to be able tocommunicate the results of studies undertaken accurately in a range of different contexts using the main concepts, constructs and techniques of the subject(s).
9. To demonstrate subject-related and transferable skills that are relevant to Zoologyrelated job trades and employment opportunities
10. To develop good observation skills and a logical approach to problem-solving.

Program Learning Outcomes [As per the UGC LOCF Template (2019)]

1. Capable of demonstrating comprehensive knowledge and understanding of major concepts, theoretical principles and experimental findings in Zoology and its different subfields (animal diversity, principles of ecology, comparative anatomy and developmental biology of vertebrates, physiology and biochemistry, genetics and evolutionary biology, animal biotechnology, applied Zoology, aquatic biology, immunology, reproductive biology, and insect, vectors and diseases), and other related fields of study, including broader interdisciplinary subfields such as chemistry, physics and mathematics.
2. Ability to use modern instrumentation for advanced genomic and proteomic technology.
3. Skilled communicator: Ability to impart complex technical knowledge relating to Zoology in a clear and concise manner in writing and oral skills.
4. Critical thinker and problem solver: Ability to have critical thinking and efficient problem-solving skills in the basic areas of Zoology (animal diversity, principles of ecology, comparative anatomy and developmental biology of vertebrates, physiology and biochemistry, genetics and evolutionary biology, animal biotechnology, applied Zoology, aquatic biology, immunology, reproductive biology, insect, vectors and diseases etc.).
5. Sense of inquiry: Capability for asking relevant/appropriate questions relating to issues and problems in the field of Zoology, and planning, executing and reporting the results of an experiment or investigation.

6. Team player/worker: Capable of working effectively in diverse teams in both classroom, laboratory and in industry and field-based situations.
7. Skilled project manager: Capable of identifying/mobilizing appropriate resources required for a project, and manage a project to completion, while observing responsible and ethical scientific conduct; and safety and chemical hygiene regulations and practices.
8. Digitally literate: Capable of using computers for Bioinformatics and computation and appropriate software for analysis of genomics and proteomics data, and employing modern bioinformatics search tools to locate, retrieve, and evaluate location and biological annotation genes of different species.
9. Ethical awareness/reasoning: Capable of conducting their work with honesty and precision thus avoiding unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, and appreciating environmental and sustainability issues.
10. Lifelong learners: Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling.

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Semester I

Course Outcomes

BSCHZOOC101 (HONOURS): SYSTEMATICS AND DIVERSITY OF LIFE: PROTISTS TO CHORDATES
Course Outcome ((Prescribed in Kazi Nazrul University Syllabus (2020-2021) after introduction of LOCF within the CBCS)
Knowledge on the followings

1. Develop understanding on the diversity of life with regard to protists, non-chordates and chordates.
2. Group animals on the basis of their morphological characteristics / structures.
3. Develop critical understanding how animals changed from a primitive cell to a collection of simple cells to form a complexbody plan.
4. Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/ cladistics tree.
5. Understand how morphological change due to change in environment helps drive evolution over a long period of time.
6. The project assignment will also give them a flavour of research to find the process involved in studying biodiversity andtaxonomy besides improving their writing skills.
7. It will further enable the students to think and interpret individually due to different animal species chosen

BSCHZOOC102 (HONOURS): ECOLOGY
Course Outcome ((Prescribed in Kazi Nazrul University Syllabus (2020-2021) after introduction of LOCF within the CBCS)
Knowledge on the followings

1. Know the evolutionary and functional basis of animal ecology.
2. Understand what makes the scientific study of animal ecology a crucial and exciting endeavour.
3. Engage in field-based research activities to understand well the theoretical aspects taught besides learning techniques for gathering data in the field.
4. Analyse a biological problem, derive testable hypotheses and then design experiments and put the tests into practice.
5. Solve the environmental problems involving interaction of humans and natural systems at local or global level.

BSCPZOOC101(PROGRAM): SYSTEMATICS AND DIVERSITY OF LIFE : PROTISTS TO CHORDATES *Course Outcome ((Prescribed in Kazi Nazrul University Syllabus (2020-2021) after introduction of LOCF within the CBCS)*
Knowledge on the followings

1. Develop understanding on the diversity of life with regard to protists, non chordates and chordates.
2. Group animals on the basis of their morphological characteristics/ structures.
3. Develop critical understanding how animals changed from a primitive cell to a collection of simple cells to form a complex body plan.
4. Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/ cladistics tree.
5. Understand how morphological change due to change in environment helps drive evolution over a long period of time.
6. The project assignment will also give them a flavour of research to find the process involved in studying biodiversity and taxonomy besides improving their writing skills.
7. It will further enable the students to think and interpret individually due to different animal species chosen.

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Semester II

Course Outcomes

BSCHZOOC201 (HONOURS): COMPARATIVE ANATOMY AND PHYSIOLOGY OF NON-CHORDATES

Course Outcome ((Prescribed in Kazi Nazrul University Syllabus (2020-2021) after introduction of LOCF within the CBCS)

Knowledge on the followings

1. Develop an understanding of the characters used to classify besides being able to differentiate the organisms belonging to different taxa.
2. Acquire knowledge of the coordinated functioning of complex human body machine.
3. Have hands on experience of materials demonstrating the diversity of protists and non-chordates.
4. Understand the relative position of individual organs and associated structures through dissection of the invertebrate representatives.
5. Realize that very similar physiological mechanisms are used in very diverse organisms.
6. Get a flavor of research by working on project besides improving their writing skills. It will further enable the students to think and interpret individually.
7. Undertake research in any aspect of animal physiology in future.

BSCHZOOC202 (HONOURS):CYTOLOGY AND HISTOLOGY

Course Outcome ((Prescribed in Kazi Nazrul University Syllabus (2020-2021) after introduction of LOCF within the CBCS)

Knowledge on the followings

1. Understand the functioning of nucleus and extra nuclear organelles and understand the intricate cellular mechanisms involved.
2. Acquire the detailed knowledge of different pathways related to cell signaling and apoptosis thus enabling them to understand the anomalies in cancer.
3. Develop an understanding how cells work in healthy and diseased states and to give a 'health forecast' by analyzing the genetic database and cell information.
4. Get new avenues of joining research in areas such as genetic engineering of cells, cloning, vaccines development, human fertility programme, organ transplant, etc.
5. Understand how tissues are produced from cells in a normal course and about any malfunctioning which may lead to benign or malignant tumor.

BSCPZOOC201 (PROGRAM): COMPARATIVE ANATOMY AND PHYSIOLOGY OF NON-CHORDATES

Course Outcome ((Prescribed in Kazi Nazrul University Syllabus (2020-2021) after introduction of LOCF within the CBCS)

Knowledge on the followings

1. Develop an understanding of the characters used to classify besides being able to differentiate the organisms belonging to different taxa.
2. Acquire knowledge of the coordinated functioning of complex human body machine.
3. Have hands on experience of materials demonstrating the diversity of protists and non-chordates.
4. Understand the relative position of individual organs and associated structures through dissection of the invertebrate representatives.
5. Realize that very similar physiological mechanisms are used in very diverse organisms.
6. Get a flavor of research by working on project besides improving their writing skills. It will further enable the students to think and interpret individually.
7. Undertake research in any aspect of animal physiology in future.

Semester III

Course Outcomes

BSCHZOOLC301 (HONOURS): DIVERSITY OF CHORDATES

Knowledge on the followings

1. Develop understanding on the diversity of life with regard to chordates.
2. Group animals on the basis of their morphological characteristics / structures.
3. Develop critical understanding how animals changed from a primitive cell to a collection of simple cells to form a complex body plan.
4. Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/ cladistics tree.
5. Understand how morphological change due to change in environment helps drive evolution over a long period of time.

BSCHZOOLC302(HONOURS): COMPARATIVE ANATOMY OF VERTEBRATES

Knowledge on the followings

1. Develop an understanding of the evolution of vertebrates thus integrating structure, function and development.
2. Have an overview of the evolutionary concepts including homology and homoplasy, and detailed discussions and comparison of anatomy of major organsystems from simpler to complex organisms.

BSCHZOOLC303(HONOURS): FUNDAMENTALS OF BIOCHEMISTRY

Knowledge on the followings

1. Understand about the importance and scope of biochemistry.
2. Understand the structure and biological significance of carbohydrates, amino acids, proteins, lipids and nucleic acids.
3. Understand the structure and function of immunoglobulins.
4. Understand the concept of enzyme, its mechanism of action and regulation.
5. Understand the process of DNA replication, transcription and translation.
6. Learn the preparation of models of peptides and nucleotides.
7. Learn biochemical tests for amino acids, carbohydrates, proteins and nucleic acids.
8. Learn measurement of enzyme activity and its kinetics.

BSCHZOOLSE301(HONOURS): APICULTURE

Knowledge on the followings

1. Explain what are the prerequisite to get started in beekeeping.
2. Describe the laws around beekeeping.
3. Discuss the responsibilities of urban beekeepers.
4. Identify where to purchase equipment and demonstrate how to assemble It.
5. Name and identify major parts of the honeybee such as the stinger or mandibular parts.
6. Describe bee biology and anatomy from the perspective of managing bees.
7. Describe the importance of wax and identify what to look for in comb during hive inspections.

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BSCHZOOLGE301 (HONOURS): ENVIRONMENT AND PUBLIC HEALTH

Knowledge on the followings

1. Understand different causes of environmental pollution and their remedies
2. Learn about the depletion and contamination of natural resources.
3. To learn waste management technologies and its applications.
4. Develop awareness about the causative agents and control measures of many commonly occurring diseases.

BSCPZOOC301 (PROGRAM): PHYSIOLOGY AND BIOCHEMISTRY

Knowledge on the followings

1. Understand the process of digestion and its control.
2. Develop understanding in muscle structure and contraction mechanism.
3. Learn the process of respiration and transport of gases.
4. Understand kidney structure and regulation of urine formation.
5. Understand heart structure and functioning.
6. Understand function of endocrine glands and formation of gametes.
7. Understand about the importance and scope of biochemistry.
8. Understand the structure and biological significance of carbohydrates, amino acids, proteins, lipids and nucleic acids.
9. Understand the structure and function of immunoglobulins.
10. Understand the concept of enzyme, its mechanism of action and regulation.

BSCPZOOLSE301(PROGRAM): APICULTURE

Knowledge on the followings

1. Explain what are the prerequisite to get started in beekeeping.
2. Describe the laws around beekeeping.
3. Discuss the responsibilities of urban beekeepers.
4. Identify where to purchase equipment and demonstrate how to assemble It.
5. Name and identify major parts of the honeybee such as the stinger or mandibular parts.
6. Describe bee biology and anatomy from the perspective of managing bees.
7. Describe the importance of wax and identify what to look for in comb during hive inspections.

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Semester IV

Course Outcomes

BSCHZOOLC401 (HONOURS): CELL BIOLOGY

Knowledge on the followings

1. Understand the functioning of nucleus and extra nuclear organelles and understand the intricate cellular mechanisms involved.
2. Acquire the detailed knowledge of different pathways related to cell signaling and apoptosis thus enabling them to understand the anomalies in cancer.
3. Develop an understanding how cells work in healthy and diseased states and to give a 'health forecast' by analyzing the genetic database and cell information.
4. Get new avenues of joining research in areas such as genetic engineering of cells, cloning, vaccines development, human fertility programme, organ transplant, etc.

BSCHZOOLC402(HONOURS): PARASITOLOGY AND IMMUNOLOGY

Knowledge on the followings

1. Describe the mechanisms for transmission, virulence and pathogenicity in pathogenic micro-organisms.
2. Diagnose the causative agents, describe pathogenesis and treatment for important diseases like malaria, leishmaniasis,trypanosomiasis, toxoplasmosis, schistosomiasis, cysticercosis, filariasis etc.
3. Assess the importance of incidence, prevalence and epidemiology in microbiological diagnostic activities.
4. Know how resistance development and resistance transfer occur.
5. Identify the major cellular and tissue components which comprise the innate and adaptive immune system.
6. Understand how are immune responses by CD4 and CD8 T cells, and B cells, initiated and regulated.
7. Understand how does the immune system distinguish self from non-self.
8. Gain experience at reading and evaluating the scientific literature in the area.

BSCHZOOLC403(HONOURS): BIOCHEMISTRY OF METABOLIC PROCESSES

Knowledge on the followings

1. Understand about the importance and scope of biochemistry.
2. Understand the structure and biological significance of carbohydrates, amino acids, proteins, lipids and nucleic acids.
3. Understand the structure and function of immunoglobulins.
4. Understand the concept of enzyme, its mechanism of action and regulation.
5. Understand the process of DNA replication, transcription and translation.
6. Learn the preparation of models of peptides and nucleotides.
7. Learn biochemical tests for amino acids, carbohydrates, proteins and nucleic acids.
8. Learn measurement of enzyme activity and its kinetics.

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BSCHZOOLSE401 (HONOURS): AQUARIUM AND FISH KEEPING

Knowledge on the followings

1. To learn the scientific method of setting an aquarium
2. To learn the culture breeding and marketing techniques of common indigenous ornamental fishes

BSCHZOOLGE401 (HONOURS): PHYSIOLOGY

Knowledge on the followings

11. Understand the process of digestion and its control.
12. Develop understanding in muscle structure and contraction mechanism.
13. Learn the process of respiration and transport of gases.
14. Understand kidney structure and regulation of urine formation.
15. Understand heart structure and functioning.
16. Understand function of endocrine glands and formation of gametes.

BSCPZOOC401 (PROGRAM): GENETICS AND EVOLUTIONARY BIOLOGY

Knowledge on the followings

1. Understand how DNA encodes genetic information and the function of mRNA and tRNA.
2. Apply the principles of Mendelian inheritance.
3. Understand the cause and effect of alterations in chromosome number and structure.
4. Develop critical understanding how animals changed from a primitive cell to a collection of simple cells to form a complex body plan.
5. Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/ cladistics tree.
6. Understand how morphological change due to change in environment helps drive evolution over a long period of time.
7. Examine the evolutionary history of the taxa based on developmental affinities

BSCPZOOLSE402 (PROGRAM): AQUARIUM AND FISH KEEPING

Knowledge on the followings

1. To learn the scientific method of setting an aquarium
2. To learn the culture breeding and marketing techniques of common indigenous ornamental fishes

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Semester V

Course Outcomes

BSCHZOOLC501 (HONOURS): MOLECULAR BIOLOGY

Knowledge on the followings

1. Develop an understanding of concepts, mechanisms and evolutionary significance and relevance of molecular biology in the current scenario.
2. Get well versed in recombinant DNA technology which holds application in biomedical & genomic science, agriculture, environment management, etc. Therefore, a fundamental understanding of Molecular Biology will help in career building in all these fields.
3. Apply their knowledge in problem solving and future course of their career development in higher education and research.
4. Get new avenues of joining research in related areas such as therapeutic strategies or related opportunities in industry.

BSCHZOOLC502(HONOURS): DEVELOPMENTAL BIOLOGY

Knowledge on the followings

1. Develop critical understanding how a single-celled fertilized egg becomes an embryo and then a fully formed adult by going through three important processes of cell division, cell differentiation and morphogenesis.
2. Understand how developmental processes and gene functions within a particular tissue or organism can provide insight into functions of other tissues and organisms.
3. Realize that very similar mechanisms are used in very diverse organisms; and development is controlled through molecular changes resulting in variation in the expression and function of gene networks.
4. Understand how the field of developmental biology has changed since the beginning of the 19th century with different phases of developmental research predominating at different times.
5. Understand the relevance of developmental biology in medicine or its role in development of diseases.

BSCHZOOLDSE501(HONOURS): ANIMAL BEHAVIOR AND CHRONOBIOLOGY

Knowledge on the followings

1. Learn a wide range of theoretical and practical techniques used to study animal behaviour.
2. Develop skills, concepts and experience to understand all aspects of animal behaviour.
3. Objectively understand and evaluate information about animal behaviour and ecology encountered in our daily lives.
4. Understand and be able to objectively evaluate the role of behaviour in the protection and conservation of animals in the wild.
5. Consider and evaluate behaviour of all animals, including humans, in the complex ecological world, including the urban environment.

BSCHZOOLDSE502(HONOURS): BIOLOGY OF INSECTA

Knowledge on the followings

1. To learn understand the general features of insects and gain knowledge about their distribution and success on Planet Earth.
2. To learn Insect's taxonomy, general morphology and physiology
3. To gain knowledge about social organization of Insects and their interaction with plants.
4. Develop understanding about the role of insects as vectors and pests.

BSCPZOOLSE503 (PROGRAM): AQUATIC BIOLOGY

Knowledge on the followings

1. Understand and apply relevant scientific principles in the area of aquatic biology.
2. Employ scientific methodologies such as experimentation and data analysis in the area of aquatic biology.
3. Critically analyse, interpret and evaluate information relevant to aquatic biology.
4. Appreciate the multidisciplinary nature of the study of aquatic biology and engage positively with people and ideas beyond their own discipline.
5. Explore some of the unique environmental problems dealing with aquatic environments.
6. Develop employable skills in freshwater biological water quality analysis.

BSCPZOOLDSE501 (PROGRAM): FISH AND FISHERIES

Knowledge on the followings

1. Develop an understanding of the classification of fishesand integrating structure, function and physiology
2. Gain an overview of the fishery and aquaculture industry
3. Express the importance of aquaculture
4. To understand the techniques involved in aquaculture practices

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SEMESTER VI

Course Outcomes

BSCHZOOLC601 (HONOURS): PRINCIPLES OF GENETICS

Knowledge on the followings

3. Understand how DNA encodes genetic information and the function of mRNA and tRNA.
4. Apply the principles of Mendelian inheritance.
5. Understand the cause and effect of alterations in chromosome number and structure.
6. Relate the conventional and molecular methods for gene manipulation in other biological systems.
7. Discuss and analyse the epigenetic modifications and imprinting and its role in diseases.
8. Get new avenues of joining research in related areas such as genetic engineering of cells, cloning, genetic disorders, human fertility programme, genotoxicity, etc

BSCHZOOLC602(HONOURS): EVOLUTIONARY BIOLOGY

Knowledge on the followings

1. Develop critical understanding how animals changed from a primitive cell to a collection of simple cells to form a complex body plan.
2. Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/ cladistics tree.
3. Understand how morphological change due to change in environment helps drive evolution over a long period of time.
4. Examine the evolutionary history of the taxa based on developmental affinities.

BSCHZOOLDSE601(HONOURS): PARASITOLOGY

Knowledge on the followings

1. Describe the mechanisms for transmission, virulence and pathogenicity in pathogenic micro-organisms.
2. Diagnose the causative agents, describe pathogenesis and treatment for important diseases like malaria, leishmaniasis,trypanosomiasis, toxoplasmosis, schistosomiasis, cysticercosis, filariasis etc.

BSCHZOOLDSE602(HONOURS): AQUATIC BIOLOGY

Knowledge on the followings

5. Understand and apply relevant scientific principles in the area of aquatic biology.
6. Employ scientific methodologies such as experimentation and data analysis in the area of aquatic biology.
7. Critically analyse, interpret and evaluate information relevant to aquatic biology.
8. Appreciate the multidisciplinary nature of the study of aquatic biology and engage positively with people and ideas beyond their own discipline.
9. Explore some of the unique environmental problems dealing with aquatic environments.
10. Develop employable skills in freshwater biological water quality analysis.

BSCPZOOLSE604 (PROGRAM): RESEARCH METHODOLOGY

Knowledge on the followings

1. Understanding of research methods appropriate to specific research and an insight into designing the research
2. Understand the data collection, analysis and scientific report writing techniques.
3. Develop skills in qualitative and quantitative data analysis and presentation.
4. Learn research ethics.
5. Develop advanced critical thinking skills.

BSCPZOOLDSE602(PROGRAM): WILDLIFE CONSERVATION AND MANAGEMENT

Knowledge on the followings

1. Develop an understanding of how animals interact with each other and their natural environment.
2. Develop the ability to use the fundamental principles of wildlife ecology to solve local, regional and national conservation and management issues.
3. Develop the ability to work collaboratively on team-based projects.
4. Demonstrate proficiency in the writing, speaking, and critical thinking skills needed to become a wildlife technician.
5. Gain an appreciation for the modern scope of scientific inquiry in the field of wildlife conservation management.
6. Develop an ability to analyse, present and interpret wildlife conservation management information.