RANIGANJ GIRLS' COLLEGE
DEPARTMENT OF ZOOLOGY

COURSE LEARNING OUTCOMES

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK

(LOCF)

UNDER THE

CHOICE BASED CREDIT SYSTEM (CBCS)

OF

KAZI NAZRUL UNIVERSITY

BSC HONOURS IN ZOOLOGY

COURSE LEARNING OUTCOMES

SEMESTER – I

Course Name: Systematics & Diversity of Life - Protists to Chordates

Course Code: BSCHZOOC101

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-1**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course is a walk for the Bachelor's entrant through the amazing diversity of living forms from simple to complex one. It enlightens how each group of organisms arose and how did they establish themselves in the environment with their special characteristics. It also deals with the differences and similarities between organisms on the basis of their morphology and anatomy which led to their grouping into taxa and clades.

Learning outcomes :

After successfully completing this course, the students will be able to:

- Develop understanding on the diversity of life with regard to protists, non-chordates and chordates.
- Group animals on the basis of their morphological characteristics / structures.
- Develop critical understanding how animals changed from a primitive cell to a collection of simple cells to form a complex body plan.
- Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/ cladistics tree.
- Understand how morphological change due to change in environment helps drive evolution over a long period of time.
- 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.
- It will further enable the students to think and interpret individually due to different animal species chosen

Course Name: Ecology

Course Code: BSCHZOOC102

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-2**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

This course will take students on a journey through the physical workings of the Earth, the interactions between species and their environments. The course highlights on some of the important aspects *viz*. growth and survival of populations and communities in different habitats, energy flow in the ecosystems, interactions between the communities, exclusion of niches and consequences of changing environment on the biodiversity.

Learning outcomes :

After successfully completing this course, the students will be able to:

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

SEMESTER – II

Course Name: Comparative Anatomy & Physiology of Nonchordates

Course Code: BSCHZOOC201

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-3**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course makes a detailed comparison of the anatomy of the different taxa of non-chordates. It also highlights how in the taxonomic hierarchy, there is an increase in-the complexity of structure and function. The course thus gives an overview of the intricate life processes and adaptive radiations in non-chordates.

Learning outcomes :

After successfully completing this course, the students will be able to:

- Develop an understanding of the characters used to classify besides being able to differentiate the organisms belonging to different taxa.
- Acquire knowledge of the coordinated functioning of complex human body machine.
- Have hands on experience of materials demonstrating the diversity of protists and non-chordates.
- Understand the relative position of individual organs and associated structures through dissection of the invertebrate representatives.
- Realize that very similar physiological mechanisms are used in very diverse organisms.
- 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.
- Undertake research in any aspect of animal physiology in future.

Course Name: Cell Biology and Histology

Course Code: BSCHZOOC202

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-4**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course provides a detailed insight into basic concepts of cellular structure and function. It also gives an account of the complex regulatory mechanisms that control cell function.

Learning outcomes :

After successfully completing this course, the students will be able to:

- Understand the functioning of nucleus and extra nuclear organelles and understand the intricate cellular mechanisms involved.
- Acquire the detailed knowledge of different pathways related to cell signalling and apoptosis thus enabling them to understand the anomalies in cancer.
- 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.
- Get new avenues of joining research in areas such as genetic engineering of cells, cloning, vaccines development, human fertility programme, organ transplant, etc.
- Understand how tissues are produced from cells in a normal course and about any malfunctioning which may lead to benign or malignant tumor.

SEMESTER – III

Course Name: Comparative Anatomy & Physiology of Chordates

Course Code: BSCHZOOC301

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-5**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course offers insight into the physiology of chordates while giving an account of their anatomy. This course also explores vertebrate morphology with the aims of understanding major events in the history of vertebrate evolution and integrating the morphology of vertebrates with their ecology, behaviour and physiological adaptation in diverse habitats. Thermal relations encountered in endo- and ectothermic animals will be explained. Selective pressures that shape to different physiological phenotypes will also be addressed in the course.

Learning outcomes :

After successfully completing this course, the students will be able to:

- Develop an understanding of the evolution of vertebrates thus integrating structure, function and development.
- Have an overview of the evolutionary concepts including homology and homoplasy, and detailed discussions of major organ systems.
- Understand how cells, tissues, and organisms function at different levels. The course content also provides the basis of understanding their abnormal function in animal and human diseases and new methods for treating those diseases.
- Develop an understanding of the related disciplines, such as cell biology, neurophysiology, pharmacology, biochemistry etc.
- Get a flavor of research besides improving their writing skills and making them well versed with the current trends. It will further enable the students to think and interpret individually due to different aspects chosen.
- Undertake research in any aspect of animal physiology in future.

Course Name: Genetics

Course Code: BSCHZOOC302

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-6**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course is designed to revise basic concepts of Genetics and then move on to advanced concepts. Some key aspects include the mechanism of inheritance, gene structure and function, sex chromosomal and autosomal anomalies, aspects of human genetics, etc. will be covered. A strong emphasis will be laid on the modern tools and techniques used in genetics.

Learning outcomes :

After successfully completing this course, the students will be able to:

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

Course Name: Biochemistry

Course Code: BSCHZOOC303

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-7**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course provides an introduction to the structure of biomolecules with emphasis on the techniques used for structure determination and analysis. The course covers basic aspects of sample preparation for analysis and aims to enlighten the students how structural information can be utilized for better understanding of biological processes.

Learning outcomes :

After successfully completing this course, the students will be able to:

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

Course Name: Beekeeping

Course Code: BSCHZOOSE301

Course Type: **SE (Theoretical)**	Course Details: **SEC-1**		L-T-P: **4-0-0**
Credit: **4**	Full Marks: **50**	CA Marks	ESE Marks
		Theoretical	Theoretical
		10	**40**

About the course :

This course tells the students what tools and equipment will be needed, the main activities in the beekeepers year, the laws and by laws governing keeping bees; discover the principles of sustainable beekeeping and how these principles can guide your Beekeeping into an enduring practice.

Learning outcomes :

After successfully completing this course, the students will be able to:

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

Course Name: Public Health and Hygiene

Course Code: BSCHZOOSE302

Course Type: **SE (Theoretical)**	Course Details: **SEC-1**		L-T-P: **4-0-0**
Credit: **4**	Full Marks: **50**	CA Marks	ESE Marks
		Theoretical	Theoretical
		10	**40**

About the course :

The course designed for public health and hygiene at graduation level will give understanding for health hygiene, dietary issues, diseases related to malnutrition, communicable and non-communicable diseases.

Learning outcomes :

After successfully completing this course, the students will be able to:

- Identify current national and global public health problems.
- Aware about the issues of food safety, water safety, vaccination, exercise and obesity, exposure to toxins.
- Frame a public health plan during any epidemic or spread of infectious disease etc.
- Analyze case studies of infant mortality and obesity.
- Assess the health inequalities with regard to gender, race, ethnicity, income etc.

SEMESTER-IV

Course Name: Behaviour and Chronobiology

Course Code: BSCHZOOC401

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-8**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course aims to explain the natural behaviour patterns, how the behaviour varies among individuals and species (wild, domestic, and captive), how current and past environments and ecology influence not only behaviour, but also the underlying gene environment interactions that shape it.

Learning outcomes :

After successfully completing this course, the students will be able to:

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

Course Name: Developmental Biology & Evolution

Course Code: BSCHZOOC402

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-9**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course explains the sequence of events starting with a single cell to the production of a very complex organism. The course not only describes how embryos develop (embryology), but also highlights how the processes of development are brought about by changing individual cells into specialized cells with specific functions (the cellular level), and how genes within the genome of the organism drive and guide these changes (the molecular level). It also deals with a comparative account of development in some select groups of animals.

Learning outcomes :

After successfully completing this course, the students will be able to:

- 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.
- Understand how developmental processes and gene functions within a particular tissue or organism can provide insight into functions of other tissues and organisms.
- 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.
- 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.
- Examine the evolutionary history of the taxa based on developmental affinities.
- Understand the relevance of developmental biology in medicine or its role in development of diseases.

Course Name: Molecular Biology

Course Code: BSCHZOOC403

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-10**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course provides an insight into the life processes at the subcellular and molecular levels. Other important aspects include DNA and molecular genetics including gene cloning, sequencing and gene mapping in addition to the powerful techniques that revolutionized the pharmaceutical, health and agricultural industries.

Learning outcomes :

After successfully completing this course, the students will be able to:

- Develop an understanding of concepts, mechanisms and evolutionary significance and relevance of molecular biology in the current scenario.
- 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.
- Apply their knowledge in problem solving and future course of their career development in higher education and research.
- Get new avenues of joining research in related areas such as therapeutic strategies or related opportunities in industry.

Course Name: Sericulture

Course Code: BSCHZOOSE401

Course Type: **SE (Theoretical)**	Course Details: **SEC-2**		L-T-P: **4-0-0**
Credit: **4**	Full Marks: **50**	CA Marks	ESE Marks
		Theoretical	Theoretical
		10	**40**

About the course :

The course gives insight into the principles of sustainable sericulture and how these principles can guide your silk moth rearing into an enduring practice. The students will know about the laws and by laws governing keeping silk moth.

Learning outcomes

Upon successful completion of this course, students should be able to:

- Generation of skilled man power in the field of sericulture,
- To impart training in extension management and transfer of technology,
- To impart training in Post Cocoon Technology,
- To provide field exposure.

Course Name: Insect Pest, Vector Biology and Management

Course Code: BSCHZOOSE402

Course Type: **SE (Theoretical)**	Course Details: **SEC-2**		L-T-P: **4-0-0**
Credit: **4**	Full Marks: **50**	CA Marks	ESE Marks
		Theoretical	Theoretical
		10	**40**

About the course :

The course provides an insight into the types of insect pests and vectors and the factors driving their spread. It also enlightens about the methods used to bring down their population below the threshold for a better management.

Learning outcomes

Upon successful completion of this course, students should be able to:

- Identify the types of insect pests particularly the most common one.
- Know the methods of sampling of the pests.
- Understand the mode of action of nematicides and the consequences of their use.
- Understand the effective way of insect pest management strategy.

SEMESTER-V

Course Name: Biotechniques

Course Code: BSCHZOOC501

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-11**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

This is the only laboratory course taught independently of lecture courses. It has full hands on approach to expose the students to modern techniques and methodologies. The diverse techniques from microscopy to spectroscopy, calorimetry, chromatography ELISA, tissue culture to cloning etc. are included to make the student well versed with these protocols and methods.

Learning outcomes

Upon successful completion of this course, students should be able to:

- Understand the purpose of the technique, its proper use and possible modifications/improvement.
- Learn the theoretical basis of technique, its principle of working and its correct application.
- Learn the construction repair and adjustment of any equipment required for a technique.
- Learn the accuracy of technique.
- Learn the maintenance laboratory equipments / tools, safety hazards and precautions.
- Understand the technique of cell and tissue culture. Learn the preparation of solution of given percentage and molarity.
- Understand the process of preparation of buffer. Learn the techniques of separation of amino acids, proteins and nucleic acids.

Course Name: Microbiology, Parasitology & Immunology

Course Code: BSCHZOOC502

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-12**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

This is a composite course with remarkable utility and importance. Microbiology being the study of microorganisms such as viruses, bacteria etc., covers theoretical studies and practical proficiency training which may help in their placement at a clinical microbiological laboratory. Parasitology component takes care of the parasites and parasitism, emphasizing the influence of parasites on the ecology and evolution of free-living species, and the role of parasites in global, public, health. Immunology part provides the students with the fundamental knowledge of the immune system and its protective roles against diseases.

Learning outcomes

Upon successful completion of this course, students should be able to:

- Carry out common procedures for culturing, purifying and diagnostics of micro-organisms understand the disease-causing potential of bacteria and viruses, and the responses of the immune system.
- Summarise and orally present current microbiological problem areas.
- Describe the mechanisms for transmission, virulence and pathogenicity in pathogenic micro-organisms.
- Diagnose the causative agents, describe pathogenesis and treatment for important diseases like malaria, leishmaniasis, trypanosomiasis, toxoplasmosis, schistosomiasis, cysticercosis, filariasis etc.
- Assess the importance of incidence, prevalence and epidemiology in microbiological diagnostic activities.
  Know how resistance development and resistance transfer occur.
- Identify the major cellular and tissue components which comprise the innate and adaptive immune system.
- Understand how are immune responses by CD4 and CD8 T cells, and B cells, initiated and regulated.
- Understand how does the immune system distinguish self from non-self.
- Gain experience at reading and evaluating the scientific literature in the area.

Course Name: Genetic Engineering and Biotechnology

Course Code: BSCHZOODSE501

Course Type: **DSE (Theoretical & Practical)**	Course Details: **DSEC-1/2**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

This course gives an insight into the direct manipulation of DNA to alter the characteristics of an organism in a particular way. It envisages concepts, mechanisms, biological designs, functions and evolutionary significance of genetic modification or manipulation in special organisms and also discusses the recent advance in recombinant DNA technology.

Learning outcomes

Upon successful completion of this course, students should be able to:

- Develop an understanding of the fundamental molecular tools and their applications of DNA modification and cloning.
- Appreciate shifting their orientation of learning from a descriptive explanation of biology to a unique style of learning through graphic designs and quantitative parameters to realize how such research and innovations have made science interdisciplinary and applied.
- Develop future course of their career development in higher education and research with a sound base.
- Apply their knowledge with problem solving approach to recommend strategies of genetic engineering for possible applications in Biotechnology and allied industry.

Course Name: Livestock Management and Animal Husbandry

Course Code: BSCHZOODSE502

Course Type: **DSE (Theoretical & Practical)**	Course Details: **DSEC-1/2**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course provides intensive study in livestock production, management, marketing, nutrition, breeding, production records, selection, animal health, waste management, and conservation practices.

Learning outcomes

Upon successful completion of this course, students should be able to:

- Understand skills and requirements necessary to find and maintain a job.
- Select and develop a breeding system for a livestock enterprise.
- Understand the importance of genetic improvement in animal production.
- Formulate feed rations for different classes of livestock.
- Identify common problems associated with livestock and horse herd health and solutions.
- Identify current and future issues relating to animal husbandry.
- Understand different marketing opportunities available for livestock production.

Course Name: Endocrinology

Course Code: BSCHZOODSE503

Course Type: **DSE (Theoretical & Practical)**	Course Details: **DSEC-1/2**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course envisages information on endocrine system with emphasis on the structure of hypothalamus and anterior pituitary. The associated hormones and the related disorders will be explained.

Learning outcomes :

After successfully completing this course, the students will be able to:

- Understand neurohormones and neurosecretions.
- Learn about hypothalamo and hypapophysial axis.
- Understand about different endocrine glands and their disorders.
- Understand the mechanism of hormone action.

SEMESTER-VI

Course Name: Biostatistics & Bioinformatics

Course Code: BSCHZOOC601

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-13**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course is aimed at introducing the application of bioinformatics and statistics in biology. The course gives an insight into the key concepts and methods used in bioinformatics; and computer storage, retrieval, analysis, visualization and distribution of information data related to biological macromolecules like DNA, RNA and proteins. It provides foundation on statistical methods to enable students to compute and interpret basic statistical parameters. As an interdisciplinary field it integrates biology, computer science, chemistry and statistics together sequence analysis structure analysis and functional analysis of biological data.

Learning outcomes

Upon successful completion of this course, students should be able to:

- Know the theory behind fundamental bioinformatics analysis methods/tool.
- Be familiar with widely used bioinformatics databases.
- Know basic concepts of probability and statistics.
- Describe statistical methods and probability distributions relevant for molecular biology data.
- Know the applications and limitations of different bioinformatics and statistical methods.
- Perform and interpret bioinformatics and statistical analyses with real molecular biology data.
- Acquire knowledge of various databases of proteins, nucleic acids. Primary, secondary and composite databases. BLAST, FASTA, DOT PLOT
- Make phylogenetic predictions or prediction of structure of proteins and nucleic acids
- Develop understanding in Primer designing
- Understand data mining tool and its practical application in a case study
- Apply the knowledge in future course of their career development in higher education and research.

Course Name: Applied Zoology

Course Code: BSCHZOOC602

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-14**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course is unique in highlighting the commercial and industrial significance/value of animals. It discusses the techniques/ methods of rearing of animals for commercial usage and the prerequisites for their successful maintenance and sustenance.

Learning outcomes

Upon successful completion of this course, students should be able to:

- Understand the culture techniques of prawn, pearl and fish.
- Understand silkworms rearing and their products.
- Understand the Bee keeping equipments and apiary management.
- Understand dairy animals management, the breeds and diseases of goats and learn the testing of egg and milk quality.
- Learn various concepts of lac cultivation.
- Be aware of a broad array of career options and activities in human medicine, biomedical research and allied health professions

Course Name: Wild Life Conservation and Management

Course Code: BSCHZOODSE601

Course Type: **DSE (Theoretical & Practical)**	Course Details: **DSEC-3/4**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course is an introduction to wildlife management and gives an account of the tools used by wildlife managers. Topics covered are to equip students with adequate knowledge of various biodiversity monitoring methodologies, conservation and management issues of vertebrate pests, wildlife conflict and over abundant species, wildlife health and diseases.

Learning outcomes

After successfully completing this course, the students will be able to:

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

Course Name: Mammalian Physiology

Course Code: BSCHZOODSE602

Course Type: **DSE** **(Theoretical & Practical)**	Course Details: **DSEC-3/4**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course deals with various physiological functions in mammals. It also gives an account of the metabolic/ biochemical pathways and the probable impact of environment on them.

Learning outcomes :

After successfully completing this course, the students will be able to:

- Understand the physiology at cellular and system levels.
- Understand the mechanism and regulation of breathing, oxygen consumption and determination of respiratory quotient.
- Understand how mammalian body gets nutrition from different biomolecules.
- Understand the process of digestion and excretion.
- Understand the organization of nervous system and process of nerve conduction.
- Understand the process of vision and hearing.
- Understand the process of muscle contraction.
- Learn the determination of haemoglobin content, blood groups and blood pressure.

Course Name: Aquatic Biology

Course Code: BSCHZOODSE603

Course Type: **DSE** **(Theoretical & Practical)**	Course Details: **DSEC-3/4**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The program of study aims to provide students with a broad-based foundation in science together with extensive subject knowledge in the discipline of aquatic biology. It also aims to develop a range of transferable research, analytical and communication skills.

Learning outcomes :

After successfully completing this course, the students will be able to:

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

ZOOLOGY GENERIC (GE) SYLLABUS

COURSE LEARNING OUTCOMES

SEMESTER-I

Course Name: Basics of Systematics and Classification

Course Code: BSCHZOOGE101

Course Type: **Generic Elective (Theoretical & Practical)**	Course Details: **GEC-1**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course will provides a comprehensive survey of the theory and methodology of systematics as they are applied today to all groups of organisms. The course is directed at those students interested in studies of evolutionary biology, biodiversity, conservation biology, and/or systematics.

Learning outcomes :

After successfully completing this course, the students will be able to:

- Comprehend the basic concepts of animal taxonomy and zoological nomenclature
- Evaluate the significance of museum specimens
- Analyze the implications of biometrics, numerical taxonomy and cladistics.
- Understand the historical development of systematic biology from the 18th century to the present.
- Gain a basic grasp on the rules and philosophy of nomenclature.
- Question what you know, and need to know, to do systematic.
- Develop the capacity to critically evaluate the primary literature.

SEMESTER-II

Course Name: Vectors, Diseases and Control

Course Code: BSCHZOOGE201

Course Type: **Generic Elective (Theoretical & Practical)**	Course Details: **GEC-2**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course provides an insight into the common vector-borne diseases, their etiology, role of vectors in their spread, host- parasite relationship and finally the strategies to manage these vectors.

Learning outcomes :

After successfully completing this course, the students will be able to:

- Develop awareness about the causative agents and control measures of many commonly occurring diseases.
- Develop understanding about the favourable breeding conditions for the vectors.
- Devise strategies to manage the vectors population below threshold levels, public health importance.
- Undertake measures or start awareness programmes for maintenance of hygienic conditions, avoidance of contact from vector, destruction of breeding spots in the vicinity of houses and cattle shed by public health education campaign.

SEMESTER-III

Course Name: Biodiversity Conservation and Sustainable Development

Course Code: BSCHZOOGE301

Course Type: **GE** **(Theoretical & Practical)**	Course Details: **GEC-3**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course provides information regarding the status of environment, the depletion of its resources, the loss of biodiversity and the remedial efforts undertaken by various agencies. The course is also focused to creating environmental awareness among learners.

Learning outcomes

Upon successful completion of this course, students should be able to:

- Develop understanding for the environment which is largely degraded in the current scenario.
- Understand the importance of bio diversity and the consequences of bio diversity loss
- Learn about the judicious utilisation of natural resources
- Follow the concept of green technology and the eco-friendly practises and other prospects of environment protection.
- Understand and practice appropriate legal/regulatory and ethical issues in the context of the work environment.
- Design research projects to collect information to assess the effectiveness of current practices, and interpret the results of a statistical analysis of data, and use this to make informed decisions.

SEMESTER-IV

Course Name: Human Physiology

Course Code: BSCHZOOGE401

Course Type: **GE** **(Theoretical & Practical)**	Course Details: **GEC-4**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course provides an insight into the structure and function of organ systems in humans and their involvement in body metabolism towards maintenance of homeostasis.

Learning outcomes

Upon successful completion of this course, students should be able to:

- Understand the process of digestion and its control
- Develop understanding in muscle structure and contraction mechanism
- Learn the process of respiration and transport of gases
- Understand kidney structure and regulation of urine formation
- Understand heart structure and functioning
- Understand functioning of nervous system.
- Understand function of endocrine glands and formation of gametes.

BSC PROGRAM IN ZOOLOGY

COURSE LEARNING OUTCOMES

SEMESTER – I

Course Name: Systematics & Diversity of Life - Protists to Chordates

Course Code: BSCPZOOC101

<table>
<tr><td>Course Type: Core

(Theoretical & Practical)</td><td colspan="2">Course Details: CC-1(1)</td><td colspan="2">L-T-P: 4-0-4</td></tr>
<tr><td rowspan="3">Credit: 6</td><td rowspan="3">Full Marks:
100</td><td colspan="2">CA Marks</td><td colspan="2">ESE Marks</td></tr>
<tr><td>Practical</td><td>Theoretical</td><td>Practical</td><td>Theoretical</td></tr>
<tr><td>30</td><td>10</td><td>20</td><td>40</td></tr>
</table>

About the course :

The course is a walk for the Bachelor's entrant through the amazing diversity of living forms from simple to complex one. It enlightens how each group of organisms arose and how did they establish themselves in the environment with their special characteristics. It also deals with the differences and similarities between organisms on the basis of their morphology and anatomy which led to their grouping into taxa and clades.

Learning outcomes :

After successfully completing this course, the students will be able to :

- Develop understanding on the diversity of life with regard to protists, non chordates and chordates.
- Group animals on the basis of their morphological characteristics/ structures.
- Develop critical understanding how animals changed from a primitive cell to a collection of simple cells to form a complex body plan.
- Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/ cladistics tree.
- Understand how morphological change due to change in environment helps drive evolution over a long period of time.
- 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. It will further enable the students to think and interpret individually due to different animal species chosen.

SEMESTER – II

Course Name: Comparative Anatomy & Physiology of Nonchordates

Course Code: BSCPZOOC201

Course Type: **Core (Theoretical & Practical)**	Course Details: **CC-1(2)**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course makes a detailed comparison of the anatomy of the different taxa of non-chordates. It also highlights how in the taxonomic hierarchy, there is an increase in the complexity of structure and function. The course thus gives an overview of the intricate life processes and adaptive radiations in nonchordates.

Learning outcomes :

After successfully completing this course, the students will be able to :

- Develop an understanding of the characters used to classify besides being able to differentiate the organisms belonging to different taxa.
- Acquire knowledge of the coordinated functioning of complex human body machine. Have hands on experience of materials demonstrating the diversity of protists and non-chordates.
- Understand the relative position of individual organs and associated structures through dissection of the invertebrate representatives.
- Realize that very similar physiological mechanisms are used in very diverse organisms.
  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.
- Undertake research in any aspect of animal physiology in future.

SEMESTER – III

Course Name: Fundamentals of Comparative Anatomy & Physiology of Chordates

Course Code: BSCPZOOC301

Course Type: **Core** **(Theoretical & Practical)**	Course Details: **CC-1 (3)**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course offers insight into the physiology of chordates while giving an account of their anatomy. This course also explores vertebrate morphology with the aims of understanding major events in the history of vertebrate evolution and integrating the
morphology of vertebrates with their ecology, behaviour and physiological adaptation in diverse habitats. Thermal relations encountered in endo- and ectothermic animals will be explained. Selective pressures that shape to different physiological phenotypes will also be addressed in the course.

Learning outcomes :

After successfully completing this course, the students will be able to :

- Develop an understanding of the evolution of vertebrates thus integrating structure, function and development.
- Have an overview of the evolutionary concepts including homology and homoplasy, and detailed discussions of major organ systems.
- Understand how cells, tissues, and organisms function at different levels. The course content also provides the basis of understanding their abnormal function in animal and human diseases and new methods for treating those diseases.
- Develop an understanding of the related disciplines, such as cell biology, neurophysiology, pharmacology, biochemistry etc.
- Get a flavor of research besides improving their writing skills and making them well versed with the current trends. It will further enable the students to think and interpret individually due to different aspects chosen.
- Undertake research in any aspect of animal physiology in future.

Course Name: Essentials of Beekeeping
Course Code: BSCPZOOSE301

<table>
<tr><td>Course Type: SE (Theoretical)</td><td colspan="2">Course Details: SEC-1</td><td>L-T-P: 4-0-0</td></tr>
<tr><td rowspan="3">Credit: 4</td><td rowspan="3">Full Marks: 50</td><td>CA Marks</td><td>ESE Marks</td></tr>
<tr><td>Theoretical</td><td>Theoretical</td></tr>
<tr><td>10</td><td>40</td></tr>
</table>

About the course:

This course tells the students what tools and equipment will be needed, the main activities in the beekeepers year, the laws and by laws governing keeping bees; discover the principles of sustainable beekeeping and how these principles can guide your beekeeping into an enduring practice.

Learning outcomes:

After successfully completing this course, the students will be able to:

- Explain what are the prerequisite to get started in beekeeping.
- Describe the laws around beekeeping in Vancouver.

- Discuss the responsibilities of urban beekeepers.
- Identify where to purchase equipment and demonstrate how to assemble it.
- Name and identify major parts of the honeybee such as the stinger or mandibular parts.
- Describe bee biology and anatomy from the perspective of managing bees.
- Describe the importance of wax and identify what to look for in comb during hive inspections

SEMESTER-IV

Course Name: Cytogenetics, Biochemistry, Immunology, Evolutionary Biology

Course Code: BSCPZOOC401

<table>
<tr><td>Course Type: Core

(Theoretical & Practical)</td><td colspan="2">Course Details: CC-1 (4)</td><td colspan="2">L-T-P: 4-0-4</td></tr>
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<tr><td>30</td><td>10</td><td>20</td><td>40</td></tr>
</table>

About the course :

The course gives insight into the principles of cytology, genetics, immunology and Biochemistry. The students will know about the cell physiology and evolutional biology.

Learning outcomes :

After successfully completing this course, the students will be able to :

- know about various components of a cell,
- know about cell physiology and sub-cellular metabolic processes
- know about components of immune system and their role in host defence system
- Undertake research in relevant field in future.

Course Name: Essentials of Sericulture
Course Code: BSCPZOOSE401

Course Type: **SE (Theoretical)**	Course Details: **SEC-2**		L-T-P: **4-0-0**
Credit: **4**	Full Marks: **50**	CA Marks	ESE Marks
		Theoretical	Theoretical
		10	**40**

About the course :

The course gives insight into the principles of sustainable sericulture and how these principles can guide your silkmoth rearing into an enduring practice. The students will know about the laws and by laws governing keeping silkmoth.

Learning outcomes :

Upon successful completion of this course, students should be able to:

- Generation of skilled man power in the field of sericulture,
- To impart training in extension management and transfer of technology,
- To impart training in Post Cocoon Technology, and
- To provide field exposure

SEMESTER-V (PROGRAM)

Course Name: Fundamentals of Genetic Engineering and Biotechnology
Course Code: BSCPZOODSE501

Course Type: **DSE (Theoretical & Practical)**	Course Details: **DSEC-1 (1)**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

This course gives an insight into the direct manipulation of DNA to alter the characteristics of an organism in a particular way. It envisages concepts, mechanisms, biological designs, functions and evolutionary significance of genetic modification or manipulation in special organisms and also discusses the recent advance in recombinant DNA technology.

Learning outcomes :

Upon successful completion of this course, students should be able to:

- Develop an understanding of the fundamental molecular tools and their applications of DNA modification and cloning.
- Appreciate shifting their orientation of learning from a descriptive explanation of biology to a unique style of learning through graphic designs and quantitative parameters to realize how such research and innovations have made science
  interdisciplinary and applied.
- Develop future course of their career development in higher education and research with a sound base.
- Apply their knowledge with problem solving approach to recommend strategies of genetic engineering for possible applications in Biotechnology and allied industry.

Course Name: Basics of Livestock Management and Animal Husbandry

Course Code: BSCPZOODSE502

<table>
<tr><td>Course Type: DSE
(Theoretical & Practical)</td><td colspan="2">Course Details: DSEC-1(1)</td><td colspan="2">L-T-P: 4-0-4</td></tr>
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<tr><td>30</td><td>10</td><td>20</td><td>40</td></tr>
</table>

About the course :

The course provides intensive study in livestock production, management, marketing, nutrition, breeding, production records, selection, animal health, waste management, and conservation practices.

Learning outcomes :

Upon successful completion of this course, students should be able to:

1. Understand skills and requirements necessary to find and maintain a job.
2. Select and develop a breeding system for a livestock enterprise.
3. Understand the importance of genetic improvement in animal production.
4. Formulate feed rations for different classes of livestock.
5. Identify common problems associated with livestock and horse herd health and solutions.
6. Identify current and future issues relating to animal husbandry.
7. Understand different marketing opportunities available for livestock production.

Course Name: Public Health and Hygiene
Course Code: BSCPZOOSE501

Course Type: **SE (Theoretical)**	Course Details: **SEC-3**		L-T-P: **4-0-0**
Credit: **4**	Full Marks: **50**	CA Marks	ESE Marks
		Theoretical	Theoretical
		10	**40**

About the course :

The course designed for public health and hygiene at graduation level will give understanding for health hygiene, dietary issues, diseases related to malnutrition, communicable and non-communicable diseases.

Learning outcomes :

After successfully completing this course, the students will be able to:

- Identify current national and global public health problems.
- Aware about the issues of food safety, water safety, vaccination, exercise and obesity, exposure to toxins.
- Frame a public health plan during any epidemic or spread of infectious disease etc.
- Analyze case studies of infant mortality and obesity.
- Assess the health inequalities with regard to gender, race, ethnicity, income etc.

SEMESTER-VI
Course Name: Introduction to Wild Life Conservation and Management
Course Code: BSCPZOODSE601

Course Type: **DSE (Theoretical & Practical)**	Course Details: **DSEC-1(2)**			L-T-P: **4-0-4**	
Credit: **6**	Full Marks: **100**	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	**10**	**20**	**40**

About the course :

The course is an introduction to wildlife management and gives an account of the tools used by wildlife managers. Topics covered are to equip students with adequate knowledge of various biodiversity monitoring methodologies, conservation and management issues of vertebrate pests, wildlife conflict and over abundant species, wildlife health and diseases.

Learning outcomes :

After successfully completing this course, the students will be able to:

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

Course Name: Physiology of Mammals

Course Code: BSCPZOODSE602

<table>
<tr><td>Course Type: DSE
(Theoretical & Practical)</td><td colspan="2">Course Details: DSEC-1(2)</td><td colspan="2">L-T-P: 4-0-4</td></tr>
<tr><td rowspan="3">Credit: 6</td><td rowspan="3">Full Marks:
100</td><td colspan="2">CA Marks</td><td colspan="2">ESE Marks</td></tr>
<tr><td>Practical</td><td>Theoretical</td><td>Practical</td><td>Theoretical</td></tr>
<tr><td>30</td><td>10</td><td>20</td><td>40</td></tr>
</table>

About the course :

The course deals with various physiological functions in mammals. It also gives an account of the metabolic/ biochemical pathways and the probable impact of environment on them.

Learning outcomes :

After successfully completing this course, the students will be able to:

- Understand the physiology at cellular and system levels.
- Understand the mechanism and regulation of breathing, oxygen consumption and determination of respiratory quotient.
- Understand how mammalian body gets nutrition from different biomolecules.
- Understand the process of digestion and excretion.
- Understand the organization of nervous system and process of nerve conduction.
- Understand the process of vision and hearing.
- Understand the process of muscle contraction.
- Learn the determination of haemoglobin content, blood groups and blood pressure.

Course Name: Insect Pest, Vector Biology and Management

Course Code: BSCPZOOSE601

<table>
<tr><td>Course Type: SE (Theoretical)</td><td colspan="2">Course Details: SEC-4</td><td>L-T-P: 4-0-0</td></tr>
<tr><td rowspan="3">Credit: 4</td><td rowspan="3">Full Marks: 50</td><td>CA Marks</td><td>ESE Marks</td></tr>
<tr><td>Theoretical</td><td>Theoretical</td></tr>
<tr><td>10</td><td>40</td></tr>
</table>

About the course :

The course provides an insight into the types of insect pests and vectors and the factors driving their spread. It also enlightens about the methods used to bring down their population below the threshold for a better management.

Learning outcomes :

Upon successful completion of this course, students should be able to:

- Identify the types of insect pests particularly the most common one.
- Know the methods of sampling of the pests.
- Understand the mode of action of nematicides and the consequences of their use.
- Understand the effective way of insect pest management strategy.