Department of Zoology
Rabindra Mahavidyalaya
Champadanga Hooghly

Year:2023-2024

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Name of the Department: ZOOLOGY System: CBCS

Programme Specific Outcome:

- Apply zoological knowledge in much broader areas of life.
- Identify and analyze problems by applying the principles of natural science.
- Provide a comprehensive understanding of various animals fromtheir primitive forms to their highly evolved forms.
- Inculcate knowledge and prepare for a successful career in the field of zoology.
- Aims to emphasize the need for biodiversity conservation.

Semester	Course	Paper Code	Paper Name	Objective Course Outcome
I	Honours	CC-1	NonChordates I	• To understand the basics of animal kingdom. • To understand and recognize the life functions of Cnidaria. • To understand the characteristics, position in animal kingdom. • To gain knowledge about the morphological, physiological and evolutionary aspects of Non-chordates. • To understand the life functions of phylum Ctenophora, Platyhelminthes, and Nematoda.
I	Honours	CC-2	Ecology	Study of organisms in relation to environment. • To understand the living and non-living component of the environment. • To understand the interaction between living and non-living parts of the environment. • To understand the aquatic ecosystem components and the aspects of conservation of animals. • To acquire training for PowerPoint presentation of relevant
I	General	GE-1A/CC-1	Animal Diversity	To understand the existing diversity of the animal kingdom. • To be able to distinguish different species on the basis of their characteristic features. • To be able to understand the complexity of life forms easily. • To build a clear concept about chordates and non-chordates. • To gain knowledge about the morphological, physiological and evolutionary aspects of different subphyla. • Structural and anatomical peculiarities among different orders of vertebrates.
II	Honours	CC-3	Non Chordates II	To build a clear concept about metamerism, the structure of coelom. • To be able to identify arthropods and gain knowledge about their diversity. • To understand the social behavior of termites and how they function in a colony. • To be familiar with mollusc diversity. To be familiar with marine invertebrates and their life functions.
II	Honours	CC-4	Cell Biology	To understand the molecular mechanism of mitosis and meiosis. • To build concepts about the signaling events that controls various life forms. • To understand the basic structure of the cell. • To understand the cytoskeleton

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				of the cell. • To understand the nuclear structure and function of the cell. • To understand the basic principles of inheritance at the molecular, cellular, and organism levels.
II	General	GE-1B/CC-2	Comparative Anatomy and Development Biology of Vertebrates	To gain knowledge about the basic principles and process of early and late development processes of animals. • To understand the working of the urogenital system. • To understand the importance of the integumentary system with reference to bodily functions. • To be able to provide a comparative account of the brain and its functions. • To build a concept about the various events involved in embryonic development.
III	Honours	CC-5	Chordates	To gain knowledge about classification of various chordates and their characteristics. • To identify various chordates through specimen study. • To build a clear concept about the origin of chordates. • To understand the aerodynamics of flight in birds. • To gain knowledge about the structural differences and life functions in terrestrial and aquatic mammals. • To gain knowledge about the zoogeographical realms, plate tectonics, and continental drift.
III	Honours	CC-6	Animal Physiology	To gain knowledge about the various metabolic and physiological mechanisms of the whole human body. • To gain fundamental knowledge about Animal Physiology. • To build clear ideas and concepts about the mechanisms that work to keep the human body alive and functioning. • To understand the important functions of tissues in maintaining overall body health. • To gain knowledge about the different signal transduction pathways of steroidal and non-steroidal hormones.
III	Honours	CC-7	Fundamentals of Biochemistry	To understand glucose metabolism in the human body. • To understand the structural and biological importance of carbohydrates. • To understand the physiological importance of essential and non-essential amino acids. • To build basic concepts about nucleotide metabolism. • To understand the mechanism of

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				enzyme action. • To understand the basic structure, function, and importance, and metabolic pathways of Lipid and Protein.
III	Honours	SEC-1	Sericulture	To understand the history, types, races, and present status of sericulture. • To understand the prospect and employment potential of sericulture. • To gain knowledge about the detailed steps of mulberry cultivation, i.e., Moriculture, which is an integral part of Sericulture. • To gain knowledge about the various sericulture centers in India. • To have a basic concept about the various techniques involved in the rearing of silkworm.
III	General	GE-1C/CC-3	Physiology and Biochemistry	To gain knowledge about the various metabolic and physiological mechanisms of whole human body. • To gain fundamental knowledge about Animal Physiology. • To build clear ideas and concepts about the mechanisms that work to keep the human body alive and functioning. • To understand the mechanism of enzyme action. • To understand the biochemical activity of medicine.
IV	Honours	CC-8	Comparative Anatomy of Vertebrates	To understand the anatomical peculiarities of different organs in vertebrates. • To understand functional activity of different organs. • To compare the structural and physiological differences between different vertebrates. • To build basic concepts about the importance of sense organs and the various receptors associated with it. • To gain knowledge about the different organ functions in reptiles, amphibians, mammals, and birds.
IV	Honours	CC-9	Animal Physiology	To understand the structure and physiology of heart. • To understand the structure and function of kidney. • To build a concept about the various physiological processes that are important for normal body functioning. • To gain knowledge about the functioning of heart and apply this knowledge to prevent heart diseases. • To understand the components of blood and how haemoglobin level impacts our overall health.

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IV	Honours	CC-10	Immunology	To gain knowledge about the migration of immune cells through the body and the anatomy of lymphoid organs. • To gain knowledge about the therapeutic strategies to treat immunological diseases. • To be able to give an account on causes and consequences of deregulated immune response. • To build a basic concept about MHC molecules and its function.
IV	Honours	SEC-2	Aquarium Fish Keeping	To gain knowledge about the morphology, behaviour, and importance of different ornamental fishes. • To identify and characterize the fishes important in aquarium fish keeping industry. • To gain knowledge about how fish keeping can be used to earn livelihood and open more employment opportunities. • To learn about the endemic and exotic fish species. • To gain knowledge about the maintenance of aquarium.
IV	General	GE-1D/CC-4	Genetics and Evolutionary Biology	To understand the process of evolution. • To understand the formation of new species. • To gain knowledge about the genetic overview of evolution. • To understand the world at different age levels. • To build concept about the diversification of different species
V	Honours	CC-11	Molecular Biology	To build a clear concept about the genetic material DNA and RNA. To understand the mechanism of DNA replication. To gain knowledge about the mechanism of transcription in prokaryotes and eukaryotes. · To understand the process of DNA repair mechanism. To know the different molecular techniques and its applications.
V	Honours	CC-12	Genetics	To build a clear concept about the principles of Mendelian genetics. To understand the process of linkage, crossing over. To understand chromosome mapping, recombination frequency, interference, coincidence andtobe able tosolve problem sumsrelatedto it. To underst and how genetic concepts affect health and disease. To understand the role of genetic mechanisms in evolution.

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V	Honours	DSE-1	Animal Biotechnology	To understand the principle and procedure of various modern molecular techniques that are used to analyze cell functioning. To build concept and idea about genome and its regulation. To know how cloned and trans genic animal are produced. To gain knowledge about DNA sequencing, PCR, DNA fingerprinting etc. To learn about the molecular diagnosis of genetic diseases.
V	Honours	DSE-2	Parasitology	To gain knowledge about the morphology, life history, pathogenicity, and control measures of different protozoan and platyhelminthes parasites. • To identify and characterize different parasitic arthropods. • To understand host-parasite relationship. • To be able to know about the prophylaxis and treatment of platyhelminth parasitic infection. • To gain knowledge about different mechanical and biological vectors.
V	General	DSE-1	Applied Zoology	To gain basic knowledge about poultry farming. • To gain basic knowledge about animal husbandry. • To gain knowledge about the economically important and medically important insect pests with their prime role. • To be able to understand the epidemiology of diseases like tuberculosis and typhoid. • To be able to learn how poultry farming and fish technology can be used to earn a livelihood.
V	General	SEC-3	Sericulture	To understand the history, types, races, and present status of sericulture. • To understand the prospect and employment potential of sericulture. • To gain knowledge about the detailed steps of mulberry cultivation, i.e., Moriculture, which is an integral part of Sericulture. • To gain knowledge about the various sericulture centers in India. • To have a basic concept about the various techniques involved in the rearing of silkworm.
VI	Honours	CC-13	Developmental Biology	To gain knowledge about the late developmental processes of animals. To gain knowledge about the implementation of human embryo in the uterus. To understand the basic concept about phases in development. To understand gastrulation in chick and frog. To know about teratogenesis and its effect on

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				embryonic development. To gain knowledge about in vitro fertilization, stem cell, and amniocentesis.
VI	Honours	CC-14	Evolutionary Biology	To understand the chemical basis of evolution. • To get a historical review of evolutionary concepts like Lamarckism, Darwinism, and Neo-Darwinism. • To know about the various events in Geological Time Scale. • To build clear concepts about the origin and evolution of Man. • To be able to construct phylogenetic trees and interpret them.
VI	Honours	DSE-3	Animal Behaviour	• To get an historical overview on the origin and study of Ethology. • To be aware of the contributions made by Nikotinbergen, Karl von Frisch, Konrad Lorenz. • To know about the different forms of learning. • To gain knowledge about the various behavioral displays among different animal species. • To learn about data collection methods and experimental designs.
VI	Honours	DSE-4	Endocrinology	• To understand the structure and function of the Endocrine system. • To be able to classify and characterize different hormones. • To know about the structure of the pineal gland, hypothalamus, and pituitary gland. • To understand the mechanism of regulation of hormone action. • To build basic concepts about estrous cycle and menstrual cycle.
VI	General	DSE-2	Immunology	• To gain knowledge about the migration of immune cells through the body and the anatomy of lymphoid organs. • To gain knowledge about the migration of immune cells through the body and the anatomy of lymphoid organs. • To gain knowledge about the therapeutic strategies to treat immunological diseases. • To be able to give an account on causes and consequences of deregulated immune response. • To build a basic concept about MHC molecules and their function.

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VI	General	SEC-4	Community nutrition and health statistics	To build concepts about community and factors affecting the health of the community. • To get a basic idea about nutritional assessment of humans, nutritional anthropometry. • To build basic concepts about statistics and calculation of mean, median, mode from statistical data. • To know about analysis of variance and its application. • To understand the principles of epidemiology.

Name of the Department: ZOOLOGY System: NEP

Programme Specific Outcome:

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- Identify and analyze problems by applying the principles of natural science.
- Provide a comprehensiveunderstanding of various animals fromtheir primitive forms to their highly evolved forms.
- Inculcate knowledge and prepare for a successful career in the field of zoology.
- Aims to emphasize the need for biodiversity conservation.

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I	Major	ZOOL1011	Non-Chordates	The main objective of this syllabus is to acquaint the students about the diversity of animals (invertebrates) of this universe especially their taxonomic position of animal kingdom as well as their physiology and organ system.	At the end of the syllabus students learn the Systematic and biology of non chordates through their adaptive features and their body organization. Comprehend the identification of species and their evolutionary relationships.
I	Major	ZOOL1051	VERMICULTURE	Vermiculture is the study Commercial application of technologies that utilize earthworms for degrading waste organic materials for sanitation and agricultural re-use. Earthworms degrade organic waste materials and convert them into vermicompost. The main objective of this course is to provide the students with knowledge of vermitechnology and its application in agriculture as well as entrepreneurship.	1. The Course Has A Broad scope for Employability. 2. Students will gather knowledge on soil earthworms; their characteristic features, occurrence, and their influence on soil fertility and solid waste management are included. 3. Students will gather knowledge on Vermicomposting technology in respect of the global level as well as the Indian perspective. 4. Application of Vermiculture products and their benefits in agriculture practice.

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I	Major	ZOOL1051	Apiculture	This Skill Enhancement Course aims to enlighten students on the health status of patients with simple diagnostic tests and evaluations. This course will help to make students self-sufficient in future. They are expected to be adept in laboratory techniques.	After completion of course, students will be able to: · Get complete knowledge of honeybees and their different casts. · Get knowledge about artificial beehive and their uses for apiculture. · To know about different diseases on enemies of honeybees. · Able to know the techniques of honey extraction and handling of honeybees. · Get a brief idea about entrepreneurship in Apiculture.
I	Minor	ZOOL1021	Non-Chordates	The main objective of this syllabus is to acquaint the students with the diversity of animals (invertebrates) of this universe especially their taxonomic position of the animal kingdom as well as their physiology and organ system.	At the end of the course students will learn about the systematics and biology of non-chordates through their adaptive features and body organization and comprehend the identification of species and their evolutionary relationships.
II	Major	ZOOL-2011	Chordates	This course is designed to give a learner the fundamental understanding of the diversity of	The students will get knowledge to explain the diversity of Protochordates and

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				Phylum Chordata with emphasis on their origin, key characteristics, classification, distribution, and function. This course will make the students enlightened with the concept of diversity, organization, adaptation, and taxonomic status of Chordates. The course will give an understanding of the systemic physiology of chordates. There will be a discussion about the affinities of chordates to different groups.	chordates. Identify the taxonomic position of chordates, their diversity, and their distribution. Gain insights about economic importance and significance Pieces and Pisciculture. Identify and distinguish between poisonous and non-poisonous snakes by observing characteristic features. Students gain knowledge about the composition and significance of venom. Gain insights About the Structural specialties of birds which will help them for Poultry (commercial application). Adaptive radiation of Mammals will give the insight into diversity and distribution of Mammals

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II	Major	ZOOL2051	SERICULTURE	The syllabus for Sericulture at undergraduate SEC according to NEP has been framed. The main objective of framing this new syllabus is to give the students a proper understanding of Sericulture. Students will get knowledge about mulberry plant cultivation, different silkworms, culture techniques, silk production, and the knowledge of diseases and enemies of silkworms. The students can be utilized the knowledge in starting their own enterprise after completion of the course.	1. Get Complete Knowledge of Silkworms and their different types. 2. Get knowledge about technology of silkworm culture and making of silk. 3. To Know About Different Diseases On Enemies Of Silkworms. 4. Get a Brief Idea about entrepreneurship in Sericulture.
II	Minor	ZOOL2021:	CHORDATES	his course is designed to give a learner the fundamental understanding of the diversity of Phylum Chordata with emphasis on their origin, key characteristics, classification, distribution and functioning. This course will make the students enlightened with the concept of diversity, organization, adaptation and	The students will get knowledge to explain the diversity of Protochordates and chordates. Identify the taxonomic position of chordates, their diversity, and their distribution. Gain insights about economic importance and significance Pieces and Pisciculture. Identify and distinguish between

Semester	Course	Paper Code	Paper Name	Objective	Course Outcome
				taxonomic status of Chordates. The course will give the understanding of systemic physiology of chordates. There will be discussion about the affinities of chordates to different groups.	poisonous and non-poisonous snakes by observing characteristic features. Students gain knowledge about the composition and significance of venom. Gain insights About the Structural specialties of birds which will help them for Poultry (commercial application). Adaptive radiation of Mammals will give the insight into diversity and distribution of Mammals.
III	Major	ZOOL3031	Biochemistry	The objective of this study is to foster enthusiasm among students for Biochemistry, highlighting its significance within the broader context of Zoology. Through this course, learners will gain an understanding of the fundamental chemistry that drives biological processes, enabling them to independently address challenges in both biology and chemistry. The curriculum covers the analysis	v This topic is designed to help learners to understand the objectives of studying Biochemistry. v The learner will get a clear concept of the structures and reactions of different biomolecules in the living system. v Learners will cope with the fast and far-reaching advancement of biological sciences in this century and be able to update themselves with the emerging concept of

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				of molecular structure and function, as well as the myriad chemical reactions occurring within living cells. It aims to ignite a sense of curiosity in students, encouraging them to explore the intricate mechanisms of various biomolecules and their interconnections. This program also seeks to motivate students to pursue advanced studies in Biochemistry and related interdisciplinary fields, thereby equipping them with the skills necessary for both salaried and entrepreneurial ventures	biochemistry. v Students will develop a deep interest in this subject, which is very important for daily life and also for different competitive examinations

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III	Major	ZOOL3032	Cell Biology	To give an idea of the different structures involved in cellular organization, both within and outside the cell; outline knowledge of division and signaling at cellular level and a detailed idea of the important subcellular components that are involved in the process of transportation of molecules to and from the cell, as well as synthesis of various proteins and ATP	The students will learn about the different subcellular components-their structure, function and biochemical properties, organization at cellular level with respect to extracellular matrix, cytoskeleton, cell junction, cell signaling and cell division. · They will also have an outline knowledge of cancer cells and apoptosis.
III		ZOOL3051	Medical Diagnostics	This Skill Enhancement Course aims to enlighten students on the health status of patients with simple diagnostic tests and evaluations. This course will help to make students self-sufficient in future. They are expected to be adept in laboratory techniques.	After completion of course, students will be able to: 1. Learn basic understanding of the structure of the human body. 2. Learn aspects related to medical diagnosis. 3. Learn to perform tests which help in the diagnosis and treatment of diseases. 4. Handle laboratory instruments. 5. Students are expected to be economically self-sufficient.

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IV	Major	ZOOL4011	Animal Physiology	To understand various functional components of an organism. To explore the complex network of these functional components. To comprehend the regulatory mechanisms for maintenance of function of the body.	To understand various functional components of an organism. To explore the complex network of these functional components. To comprehend the regulatory mechanisms for maintenance of function of the body.
IV	Major	ZOOL4012	Disease Biology	The specific learning goals for disease biology are to explore the causes of diseases of the animal world and to provide students with a working knowledge of fundamental concepts and molecular mechanisms leading to diseases. This will help in further understanding of the immune responses facilitating recovery and protection, also examine the mechanism of action of disease therapies and investigate the physiological and ecological factors that influence the frequency of disease occurrence.	The specific learning goals for disease biology are to explore the causes of diseases of the animal world and to provide students with a working knowledge of fundamental concepts and molecular mechanisms leading to diseases. This will help in further understanding of the immune responses facilitating recovery and protection, also examine the mechanism of action of disease therapies and investigate the physiological and ecological factors that influence the frequency of disease occurrence.

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IV	Major	ZOOL4013	Comparative Endocrinology	To introduce basic terms of Endocrinology. To develop conceptual clarity of Endocrinology. To familiarize the learners with the structure, types, and classification of chromosomes. To introduce the concept of sex determination and its types, sex-linked, sex-influenced, and sex-Limited Genes. To develop an understanding of genetic variability within a population and learn as to how the changes take place.	v Students understand how the endocrine system is functioning. v They know the structures and molecular modes of action of a large variety of vertebrate and in vertebrate hormones and understand how metazoan hormones and their functional mechanisms have evolved. v Hormones as mediators of growth, development, phenotype, behavior, reproduction, and epigenetic effects are covered and connected to relevant current events.
IV	Minor	ZOOL4051	Wildlife Conservation	To provide a knowhow of the (a) various aspects of wildlife, including their values, depletion, conflicts with human beings and principles of conservation and various ecological attributes, (b) Management and legal protection of different natural habitats and threatened species, and (c) different tools and techniques	At the end of the course, students should learn about the importance of wildlife and conservation in and around our surroundings as well as wild habitats and their relation to different ecological principles, emerging cases of man – animal conflict and impact of ecotourism on wild animals, with a general

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				related to wildlife study. Objectives of the Course	knowledge on the different legal structures associated with wildlife fauna.
V	Major	ZOOL5011	Genetics	To develop conceptual clarity of Mendelian principles of inheritance and other forms and patterns. To introduce the concept of sex determination and its types sex-linked, sex-influence and sex-limited genes. To develop an understanding of genetic variability within a population and learn as to how the changes take place	Integrate the knowledge of principles of inheritance. Imbibe the concept of chromosomes, multiple alleles, linkage, crossing over, sex determination. Compare the structure and types of chromosomes, genetic disorder and cancer.
V	Major	ZOOL5012	Molecular Biology	To give an idea of the relationship between DNA, RNA and protein synthesis, to study the interaction of different factors regulating these processes and the different processes of DNA repair.	The students will be able to understand the molecular basis of various biological processes and the diverse mechanisms of gene regulation.

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V	Major	ZOOL5013	Animal Biotechnology	To understand Biotechnology, which is a major tool in modern research, especially in biological sciences, medical sciences, forensic science, and environmental science. To know the various techniques for research work. It is truly regarded as the scientific technology of the twenty-first century	At the end of the course, the students will be able to develop the skill of modern techniques of biological tools at the molecular level of research; enhance basic laboratory skills like keen observation, analysis, and discussion; learn the functional attributes (molecular level) of different cell type and disorder of the various cell and help in diagnosis of the different disorders.
VI	Major	ZOOL6011	Evolutionary Biology and Ethology	1. Evolutionary Biology is a foundational science that explores the origin of life, various theories of evolution, animal evolution, and evolutionary genetics. Understanding evolutionary biology provides insights into how organisms have evolved over time and the processes that drive these changes 2. Ethology is an important branch of Zoology today. Understanding animal behaviour is crucial for students, as it aids in	1. Students will get knowledge of the history of life on earth and the causal processes of evolution 2. Students will gather knowledge about the causes of the extinction of species and the application of genetics in evolution 3. Students will be able to learn some essential aspects of Evolutionary Biology and acquire an understanding of the subject 4. Knowledge of animal behaviours increases the students'

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				the conservation process and promotes better coexistence with other species	understanding of how behaviours help animals survive, reproduce, and interact with nature 5. Knowledge of wildlife will help in their conservation, and human-animal coexistence rather than conflict 6. Study of animal behaviour can help to develop new approaches and ideas for the conservation and management of wildlife
VI	Major	ZOOL6012	Ecology and Conservation Biology	Understanding ecology and biodiversity provides a thorough knowledge of the interactions between organisms and their environment, including various ecosystem components and functions that are important for maintaining biodiversity, as well as the role of species, populations and communities in ecological processes. In this era of rapid biodiversity loss, conservation biology focuses on protecting wildlife and other components of biodiversity.	Students will get knowledge of the fundamentals of ecological organisation, limiting factors and different attributes related to population, community and ecosystem levels of organisation. Students will gather knowledge on different aspects of biodiversity, including its levels, species diversity measures and indices, megadiverse countries and biodiversity hot spots. Knowledge of wildlife and conservation biology

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				This is achieved through various management strategies, efforts, and policies implemented at local, national, and global levels.	will help to increase awareness among students regarding the importance of wildlife and different biodiversity components in maintaining a healthy relation between man and environment. The students will be able to learn about different management techniques to protect the threatened wild animals and ecosystems, like the tigers, hoolock gibbon, red panda, snow leopard, pygmy hog, golden langur, etc. in India.
VI	Major	ZOOL6013	Developmental Biology	Study of Developmental Biology aims to provide an understanding of the development of a single cell into an organised grouping of cells, which is programmed at specific times to become specialised	Upon successful completion, students will have the knowledge and skills to: 1. Explain the molecular and genetic background of animal development 2. Describe the evolutionary history of complex multicellular life forms 3. Compare environmental influences in the development and homeostasis of cells

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VI	Major	ZOOL6014	Histology and Histochemistry	Students will learn Bioanalytical Techniques, including mammalian tissue structure, histopathological changes in diseases, and permanent slide preparation. They will explore immunofluorescence, protein identification, and cell morphology alterations. The course covers immunohistochemistry, cryotechniques, enzyme histochemistry, and histochemical methods for detecting carcinomas using immunofluorescent techniques.	The study of mammalian tissues at the histological level involves understanding their structural organisation and disease-induced morphological alterations. It explores the relationship between aetiology, pathogenesis, and histopathological changes. Key techniques include permanent slide preparation, immunofluorescence, immunohistochemistry, and enzyme histochemistry, which aid in protein localisation and carcinoma detection.