ASANSOL GIRLS' COLLEGE

Department of Zoology

Programme Specific Outcome (PSO) and Course Outcome (CO)

Programme Specific Outcome (PSO):

The Programme enables the students

PSO1: To understand the nature and basic concepts of cell biology, genetics, taxonomy, physiology, ecology and applied Zoology.

PSO2: To analyze the relationships among animals with their ecosystems.

PSO3: To perform procedures as per laboratory standards in the areas of Taxonomy, Physiology, Ecology, Cell biology, Genetics, Applied Zoology, Clinical science, tools and techniques of Zoology, Toxicology, Sericulture, Biochemistry, Fish biology, , Immunology and research methodology.

Course Outcome (CO)

Semester	Course Name and topic	Module specific CO
Semester I (Major & Minor)	Course name: Diversity of Non-chordates	
	Unit I: Principles of Animal Classification	CO1. Students learned about systematic classification, principle of priority, principle of typification etc. They learned about binomial nomenclature and its utility. The students examine the diversity and evolutionary history of a Taxon through the construction of a basic phylogenetic tree.
	Unit II: Multicellularity and Origin of Metazoa	CO2. Students understand the species concept and thus to identify different species. They came to know the concept of symmetry, metamerism and studied different types of body cavities.
	UNIT III: Diversity in Protists, Acoelomate and Pseudocoelomate Metazoa	CO3. Develop understanding on the diversity of life with regard to protists and non-chordates. Group animals on the basis of their morphological characteristics/structures Develop a critical understanding how animals changed from a primitive cell to a collection of simple cells to form a complex body plan. They understand the concept of polymorphism and division of labour in cnidaria and learned about coral reefs known for its biodiversity and productivity. Learned about *Taenia sp.* And *Ascaris sp.* and their parasitic adaptations and pathogenicity.
	UNIT IV: Diversity in and Coelomate Non chordates and hemichordates	CO4. They learned the classification and characteristics of Annelids, molluscs etc. They understand the torsion and detorsion

		in gastropods. Students came to know the affinities between different groups indicating common ancestry or evolution.
	Course Name: Public Health and Hygiene	
	Unit-I: Maintenance of personal and community hygiene	CO1. The students become aware about the current national and global public health problems and importance of hygiene. They became aware about pollution and environment.
	Unit-II: Nutrient deficiency & diseases	CO2. They knew about balanced diet, nutrient deficiency diseases, malnutrition. They knew the importance of breastfeeding and food plan for different age groups. They knew about the health inequalities with regard to gender, race, ethnicity, income.
	Unit-III: Communicable and contagious diseases	CO3. They studied about different communicable viral diseases. They became aware about the issues of food safety, water safety, vaccination exercise and obesity, exposure to toxins. They become able to frame a public health plan during any epidemic or spread of infectious disease etc.
	Unit-IV: Non-communicable diseases and cure	CO4. They learned about non-communicable diseases, mental health, diabetes, obesity, some diseases related to bones. They can now do and analyze case studies of infant mortality and obesity.

	Course Name: Application of Bio-Science	
	Unit-1: Applied Zoology-I	CO1. They gain knowledge about vermin-culture and vermicomposting. They studied about honey bees, apiculture, the Bee keeping equipments and apiary management, bee products, diseases and control etc. They learned about silkworms, their rearing and their products.
	Unit-2: Applied Zoology-II	CO2. The Students studied and understood the process of culture techniques of prawn, pearl and fish. They studied about poultry and dairy animal breeding. They learned the testing of egg and milk quality.
	Unit-3: Clinical & Experimental Bio-science-I	CO3. Be aware of a broad array of career options and activities in human medicine, biomedical research and allied health¬ professions, learned about vaccine, cancer.
	Unit-4: Clinical & Experimental Bio-science-II	CO4. Develops the understanding about clinical as well as experimental applications of biosciences.
Semester II (Major & Minor)	Course name: Diversity of Chordates	
	Unit 1: Proto-chordata and Agnatha	CO1. They know about different proto-chordates and understand the connection between different groups. They studied retrogressive metamorphosis in amphibians.
	Unit 2: Ectotherms: Pisces, Amphibia and Reptilia	CO2. They studied the characteristics and classification of fishes. They developed a critical understanding of how aquatic to terrestrial journey happens in chordate animals by studying about lung

		fishes the link between fishes and amphibians. They studied about reptiles their classification etc. They studied about *Sphenodon sp.*
	Unit 3: Endotherms: Aves and Mammalia	CO3. They studied about *Archaeopteryx* - a connecting link between reptiles and birds. They knew the characteristics and classification of birds and mammals.
	Unit 4: Specialized systems	CO4. They understand the structure of poison apparatus and biting mechanism in snakes. They studied about ruminant stomach in cattle and buffaloes.
	Course Name: Instrumentation and Clinical Diagnosis	
	UNIT I : Principles of Microscopy	CO1. The students understand the concept of Resolving Power, Limit of Resolution and Magnification, Numerical Aperture. Studied about different types of microscope.
	UNIT II : Tools and techniques in Biochemistry and Physiology	CO2. Studied about molarity, normality etc. They learned about PAGE, centrifugation etc. Understand the process of preparation of buffer. Learn the techniques of separation of amino acids, proteins and nucleic acids.
	UNIT III : Tools and Techniques in Endocrinology and immunology	CO3. They studied about antigens, antibody, immune response, ELISA etc.

	UNIT IV: Cell culture and clinical diagonosis	CO4. Understand the technique of cell and tissue culture. Learn the preparation of solution of given percentage and molarity.
Semester III	Course Name: Comparative Anatomy & Physiology of Chordates	
	UNIT- I: Structure and function of integument, skeletal and muscular systems	CO1. The students learned about the integumentary, skeletal and muscular systems. They studied about different types of modifications of integument like hair, feathers, horn, scales etc,
	UNIT-II: Structure and function of digestive, circulatory and endocrine systems	CO2. The students learned about the different types of organ systems like digestive system, circulatory system, and endocrine system and; They knew the ruminant stomach of cattle, learned about different respiratory organs, Students also learned about different endocrine glands their function, and the role of different hormones in the regulation of homeostasis of body.
	UNIT-III: Structure and function of respiratory and excretory systems	CO3. The students learned about the respiratory system, excretory system, system in the body of different classes of vertebrates and the development of
	UNIT- IV: Structure and function of nervous and reproductive systems	CO4. They understand the nervous and reproductive systems. They knew the concept of reflex arc and reflex action, synapse etc. The menstruation and gametogenesis is well understood.

Course Name: Genetics	
UNIT I: Concept of Genes and Genomics	CO1. Students came to know the basic concept of genetics when they studied Mendelian principle of inheritance. They knew how different traits passed from one generation to the next, and why some diseases occur in an individual if it occurred to any member of the family. They also learned about incomplete dominance, co-dominance, epistasis, multiple allele .
UNIT II: The recombination and interaction of Genes	CO2. They understand the concept of sex is determination and dosage compensation in human and *Drosophila sp*.
UNIT III: Regulation of Gene expression, regulation and mapping	CO3. They learned about Operon and model organisms.
UNIT IV: Human Population Genetics and Genetic Counselling	CO4. They learned about different types of genetic diseases and chromosomal aberrations in human like Down syndrome, Klinefelter syndrome, Turner syndrome, Cri du chat, sickle cell anaemia etc, their cause, symptoms etc; The understood inheritance of these genetic diseases following rules of inheritance via pedigree analysis. In practical they learned to identify the different mutants of *Drosophila sp*. etc.
Course Name: Biochemistry	
UNIT I: Introduction to Biochemistry and biology of Carbohydrates	CO1. Students learned about the structure of carbohydrates and their metabolism through Glycolysis, Krebs cycle, Pentose phosphate pathway etc. They also understand the processes like glycogenesis, glycogenolysis, gluconeogenesis

UNIT II: Lipids: Structure and Biological significance	CO2. They understand the structure of lipids and fats, their role in life, Beta oxidation etc.
UNIT III: Biology of Proteins and Enzymes	CO3. They studied the protein structure and metabolism. They understand the concept of enzyme and enzyme action, enzyme kinetics, enzyme inhibition; They understand the structure and function of immunoglobulin.
UNIT IV: Nucleic acids and chromosome	CO4. They learned about the structure and function of DNA and RNA.
Course Name: Beekeeping	
Unit I: Introduction to Apiculture	CO1. Name and identify major parts of the honeybee such as the stinger or mandibular parts. The caste system and division of labour among different bee caste is well understood. They learned bee biology and anatomy from the perspective of managing bees
Unit II: Bee keeping as an occupation	CO2. Explained the prerequisite to get started in beekeeping. To identify where to purchase equipment and demonstrate how to assemble it.
Unit III: The first step in beekeeping	CO3. To manage (Seasonal and Routine) a colony, the manipulation of a colony. They learned about the uses of different bee products.
Unit IV: Entrepreneurship in Beekeeping industry	CO4. The scope of bee keeping industry is known. Students understand the role of apiculture in economic growth and employment.

Semester IV	Course Name: Behaviour and Chronobiology	
	UNIT I: Introduction and patterns of Behaviour	CO1. The students learnt a wide range of theoretical and practical techniques used to study animal behaviour. They developed skills, concepts and experience to understand various aspects of animal behaviour like learning, territoriality and foraging.
	UNIT II: Innate behaviour; Evolution of reproductive behaviour	CO2. They studied how animals communicate. They understand that for how much time an animal remain and forage for food in a food patch. They learned how animals select for a habitat.
	Unit III: Reproductive behaviour and socio-biology	CO3. The study of this paper opened their mind about the different behavioural aspects like altruism, selfishness, parental care, aggressiveness etc. in animals. They came to know about mating behaviour, defence etc in animals.
	UNIT IV: Genetic, Neural, and Hormonal regulation of behaviour	CO4. They understand the hormonal regulation of biological clock. They studied the genetic basis of behaviour.
	Course Name: Developmental Biology & Evolution	
	UNIT I: How does reproduction start, commence and modify in living system?	CO1. They become able to list the types of characteristics that make an organism ideal for the study of developmental biology. They understand the process of gametogenesis, fertilization and early embryogenesis.

	UNIT II: How does development affect organization of phenotypes and their variation?	CO2. They became able to describe cleavage, different patterns of cleavage pattern, mechanism of gastrulation. They understand organogenesis, Concept of organizer and competence, stem cells etc. Able to understand difference between specification and determination.
	UNIT III: Tracing the evolutionary biology of development	CO3. They studied about embryonic membranes and different types of placenta. They understand the concept of metamorphosis and regeneration.
	UNIT IV: Understanding evolution through natural selection, adaptation and optimal models trade offs	CO4. They develop an insight to the overview of evolutionary biology, concept of organic evolution. They learned the evolutionary theories: Lamarkism, Darwinism, modern synthetic theory and neutral theory of Kimura. They understand the concept of mode of speciation, evolution, systematics, biological classification, origination, extinction, and causes of differential rates of diversification and human evolution.
	Course Name: Molecular Biology Course	
	Unit -1: Central dogma; Genome and Nucleic acid properties	CO1. They studied about DNA structure, DNA methylation etc.
	Unit –II: DNA replication, mismatch and repair	CO2. An overview of DNA replication, recombination and DNA damage and repair has developed in students.
	Unit –III: RNA transcription, processing, editing, splicing etc.	CO3. They understand transcription and regulation of transcription, RNA editing etc.

	Unit –IV: Genetic Code and Translation	CO4. They understand the concept of genetic code, translation and post-translational modification.
	Course Name: Sericulture	
	Unit I: Silkworm distribution and races	CO1. They studied the morphology of silkworm, about different races of silk worm.
	Unit II: Biology of silkworm and rearing technology	CO2. The students studied about Mulberry and non-mulberry Sericulture and biology of mulberry and Tasar silkworm.
	Unit III: Diseases & pests of silk worm with prevention & control	CO3. They studied about different diseases and parasites of silkworm.
	Unit IV: Prospects of Sericulture in India	CO4. They knew the scopes in sericulture. They studied importance of silk and sericulture in providing employment and women and rural empowerment.

Semester V Honours	Course Name: Bio techniques	
	UNIT I : Microscopy	CO1. Understand the purpose of the technique, its proper use and possible modifications. Learn the theoretical basis of technique, its principle of working and its correct application. Studied about different types of microscope.
	UNIT II : Tools and techniques in Biochemistry and Physiology	CO2. Studied about molality, normality etc. They learned about PAGE, centrifugation etc. Understand the process of preparation of buffer. Learn the techniques of separation of amino acids, proteins and nucleic acids.
	UNIT III : Tools and Techniques in Endocrinology and immunology	CO3. They studied about antigens, antibody, immune response, ELISA etc.
	UNIT IV: Cell culture, maintenance of Laboratory animals	CO4. Understand the technique of cell and tissue culture. Learn the preparation of solution of given percentage and molarity.
	Course Name: Microbiology, Parasitology & Immunology	
	UNIT-I: Microbiology: A brief account of pathogenic viruses, bacteria and fungi.	CO1. Carry out common procedures for culturing, purifying and diagnostics of micro-organisms. Students understand the disease-causing potential of bacteria and viruses, and the responses of the immune system. Describe the mechanisms for transmission, virulence and pathogenicity in pathogenic

		micro-organisms.
	UNIT-II: Parasitology: an overview of common parasitic infections.	CO2. 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.
	UNIT-III: Immunology: Immune mechanism and related pathways.	CO3. 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.
	UNIT-IV: Acquired immunity, Hypersensitivity and autoimmune disorders	CO4. Understand how does the immune system distinguish self from non-self. Gain experience at reading and evaluating the scientific literature in the area. They understand the concept of Hypersensivity.
	Course Name: Genetic Engineering and Biotechnology	
	UNIT I: Introduction to genetic engineering	CO1. Develop an understanding of the fundamental molecular tools and their applications of DNA modification and cloning.
	UNIT II: Recombination and cloning	CO2. They understand the Recombinant DNA technology and concept of cloning.
	UNIT III: Recent advances in gene technology	CO3. To recommend strategies of genetic engineering for possible application in Biotechnology and allied industry.

		They learned the method of developing transgenic organisms and their utility.
	UNIT IV: Genomic Studies, Ethical issues in genetic engineering.	CO4. Students knew the ethical issues in genetic engineering
	Course Name: Endocrinology	
	Unit-I: The chemical messangers	CO1. Understand the mechanism of hormone action.
	Unit II: Hypothalamo-hypophysial Axis	CO2. Understand neurohormones and neurosecretions. Learn about hypothalamo and hypophysial axis.
	Unit-III: Peripheral Endocrine Glands	CO3. Understand about different endocrine glands and their disorders
	Unit-IV: Regulation of Hormone Action	CO4. The studied the genetic regulation of hormones.
Program	Course Name: Basics of Livestock Management and Animal Husbandry (DSE)	
	Unit I: Animal products and breeding systems	CO1. Select and develop a breeding system for a livestock enterprise. Studied about different animal products. They knew about artificial breeding. Identify current and future issues relating to animal husbandry.
	Unit II: Animal nutrition	CO2. Formulate feed rations for different classes of livestock.
	Unit III: Maintenance of	CO3. Understand skills and requirements

	breeds	necessary to find and maintain a job. Understand the importance of genetic improvement in animal production.
	Unit IV: Marketing and related issues.	CO4. Understand different marketing opportunities available for livestock production
	Course Name: Public Health and Hygiene (SEC)	
	Unit-I: Maintenance of personal and community hygiene	CO1. The students become aware about the current national and global public health problems and importance of hygiene. They became aware about pollution and environment.
	Unit-II: Nutrient deficiency & diseases	CO2. They knew about balanced diet, nutrient deficiency diseases, malnutrition. They knew the importance of breastfeeding and food plan for different age groups. They knew about the health inequalities with regard to gender, race, ethnicity, income.
	Unit-III: Communicable and contagious diseases	CO3. They studied about different communicable viral, bacterial diseases. They became aware about the issues of food safety, water safety, vaccination exercise and obesity, exposure to toxins. They become able to frame a public health plan during any epidemic or spread of infectious disease etc.
	Unit-IV: Non-communicable diseases and cure	CO4. They learned about non-communicable diseases, mental health, diabetes, obesity, some diseases related to bones. They can now do and analyze case studies

		of infant mortality and obesity.
Semester VI Honours	Course Name: BIOSTATISTICS & BIOINFORMATICS	
	UNIT I: Data collection, distribution, presentation, authentication and analysis	CO1. They understand the basic concepts of probability and statistics
	UNIT II: Correlation, regression, analysis of variance etc.	CO2. They knew about different statistical methods and probability distributions relevant for molecular biology data.
	UNIT III: Basics of IT; Data archiving systems etc	CO3. The students understand the theory behind fundamental bioinformatics analysis methods/tool. They became aware about widely used bioinformatics databases Perform and interpret bioinformatics and statistical analyses with real molecular biology data.
	UNIT IV: Data base management: software, packages and tools	CO4. They knew how to apply bioinformatics and limitations of different bioinformatics and statistical methods. They acquired knowledge of various databases of proteins, nucleic acids. Primary, secondary and Composite databases. They developed understanding in Primer designing. Now they can make phylogenetic predictions or prediction of structure of proteins and nucleic acids. They knew about the data mining tool and its practical application in a case study.
	Course Name: APPLIED ZOOLOGY	
	UNIT I: Aquaculture(Prawn culture, Pearl Culture, Fish Culture)	CO1.The Students studied and understood the process of culture techniques of prawn, pearl and fish.
	UNIT II: Apiculture, Lac culture and Sericulture	CO2. They studied about honey bees, apiculture, the Bee keeping equipments and apiary management, bee products, diseases and control etc. They learned about lac insect, concepts of

		lac cultivation They learned about silkworms, their rearing and their products.
	UNIT III: Dairy management and poultry farming UNIT IV: Vermiculture;	CO3. They studied about poultry and dairy animal breeding. They learned the testing of egg and milk quality. CO4. They gain knowledge about vermin-culture and vermin-composting.
	Course Name: Mammalian Physiology	
	Unit-I: An overview of respiration and circulation in mammals	CO1. The students understood the physiology at cellular and system levels. They understood the mechanism and regulation of breathing, internal respiration. They knew about respitatory quotient and transportation of respiratory gases in body.
	Unit-II: An overview of digestion and excretion in mammals	CO2. They knew how mammalian body gets nutrition from different biomolecules. They understand the processes of digestion and excretion, their significance etc.
	Unit-III: An overview of nervous system and coordination in mammals	CO3. The studied about nervous system and process of nerve conduction, reflex arc etc. They knew about the structure of eye and ear and the process of vision and hearing.
	Unit-IV: An overview of Muscular system and muscle contraction in mammals	CO4. They studied the muscle structure and understand the mechanism of muscle contraction. They learned how to determine haemoglobin content.

		They learned to determine blood groups and blood pressure.
	Course name: Aquatic biology	
	UNIT – I Abiotic conditions of Freshwater ecosystems	CO1. The students understand and apply relevant scientific principles in the area of aquatic biology. The students became able to employ scientific methodologies such as experimentation and data analysis in the area of aquatic biology They became able to analyse, interpret and evaluate information relevant to aquatic biology. They developed employable skills in freshwater biological water quality analysis.
	UNIT II Aquatic organisms	CO2. They understand how evolution helped in the aquatic mode of life in aquatic organisms
	UNIT – III Abiotic conditions of marine ecosystems	CO3. They studied about different aquatic ecosystem
	UNIT – IV Management of Aquatic Resources	CO4. They explored some of the unique environmental problems dealing with aquatic environments.
Program	Course Name: Physiology of Mammals (DSE)	
	Unit-I: An overview of respiration and circulation in mammals	CO1. The students understood the physiology at cellular and system levels. They understood the mechanism and regulation of breathing, internal respiration. They knew about respitatory quotient and transportation of respiratory gases in body.

	Unit-II: An overview of digestion and excretion in mammals	CO2. They knew how mammalian body gets nutrition from different bio-molecules. They understand the processes of digestion and excretion, their significance etc.
	Unit-III: An overview of nervous system and coordination in mammals	CO3. The studied about nervous system and process of nerve conduction, reflex arc etc. They knew about the structure of eye and ear and the process of vision and hearing.
	Unit-IV: An overview of Muscular system and muscle contraction in mammals	CO4.They studied the muscle structure and understand the mechanism of muscle contraction. They learned how to determine haemoglobin content. They learned to determine blood groups and blood pressure.
	Course Name: Insect Pest, Vector Biology and Management (SEC)	
	UNIT I : Background to Insect Pests and Vectors	CO1. Identify the types of insect pests particularly the most common one. They studied the population dynamic of pest.
	UNIT II: Approaches to Insect Pest and Vector Management	CO2. They learned the methods of pest control, different insecticides. Understand the mode of action of insecticides and the consequences of their use.
	UNIT III: Approaches to Insect Pest and Vector Management	CO3. Understand the effective way of insect pest management strategy like biological control that do not cause any harm to the environment.
	UNIT IV: Legislation and other alternatives of pest	CO4. In this chapter they know about IPM, damage, etc.

control