Course Structure FOR
Choice Based Credit System of
B.Sc. (Zoology) Program with effect from 2020-21
School of Science, UPRTOU, Prayagraj

Semester	Course Code	Title of Paper	Credits	Max. Marks
I	UGZY -101	Animal Physiology	2	100
	UGZY -101P	Practical Work	2	100
II	UGZY -102	Diversity of Animal life	2	100
	UGZY -102P	Practical Work	2	100
III	UGZY -103	Genetic and Cell Biology	2	100
	UGZY -103P	Practical Work	2	100
IV	UGZY -104	Hemichordata and Chordata	2	100
	UGZY -104P	Practical Work	2	100
V	**Discipline Centric Elective Course**			
	DCEZY -105	Animal distribution and ecology	2	100
	DCEZY -106	Taxonomy and Evolution	2	100
	DCEZY -107P	Practical Work	2	100
	Skill Enhancement Course			
	SBSZY-03	Economic zoology and environmental biology	4	100
VI	**Discipline Centric Elective Course**			
	DCEZY -108	Developmental Biology	2	100
	DCEZY -109	Molecular Biology and Genetic Engineering	2	100
	DCEZY -110P	Practical Work	2	100
		Total Credit	**36**	**1500**

UGZY-101

Animal Physiology

Physiological processes in mammals with special references to man

Unit-1: Physiology of Digestion:

- Nutrition – Carbohydrates, Lipids, Proteins, Vitamins and Minerals
- Feeding Mechanism
- Digestive Tract and process of Digestion
- Digestive Enzymes, its Regulation and Control
- GIT System
- Absorption of products of Digestion

Unit-2: Physiology of Respiration:

- Respiratory System
- Modes of Respiration
- Structural Organization of Lungs and other Respiratory Structures
- Process of Gaseous Exchange
- Hemoglobin,
- Respiratory Gases and its Transport
- Regulation of Respiration

Unit-3: Circulatory System – Composition of body Fluids, Blood plasma:

- General plan of Circulatory Systems (Circulation)
- Structure of Mammalian Heart
- Excitation of Heart
- Cardiac Output
- Blood Vessels, Arteries, Veins and Capillaries
- Blood Flow
- Lymphatic System
- Haemostatic Mechanisms

Unit-4: Excretion

- Nitrogen Excretion with Formation of Ammonia
- Ammonotelic, Ureotelic , Urecotelic Animals
- Glomerular Filtration
- Reabsorption and Secretion in Renal Tubules
- Function and Regulation of Vertebrate Kidney

Unit-5: Osmoregulation:

- Functional Principles of Osmoregulation and membrane permeability
- Problems of Osmoregulation
- Osmoregulation in Aqueous (Fresh, Marine) and Terrestrial Environment

Unit-6: Nervous System:

- Nervous System and Nerve Cells
- Nerve Impulse, Action Potential
- Conduction of Nerve Impulse
- Synaptic Transmission, Chemical Synaptic Transmission, Post Synaptic Potential
- Neurotransmitters
- Neural Circuits

Unit-7: Muscle:

- Structure of Vertebrate Skeletal Muscle
- Mecahnism and Control of Muscle Contraction
- Initiation of Muscle Contraction
- Cardiac and Smooth Muscle

Unit 8: Physiology of Endocrine System:

- Hormonal Control Mechanism
- Chemical Nature, Synthesis and Storage of Hormones
- Secretion of Hormones
- Steroid
- Thyroid and Peptide Hormones
- Neuroendocrine Connection
- Hypothalamus and Pituitary
- Regulation of Hormones
- Pheromones

UGZY-102
Diversity of Animal Life

Unit 1:

- General Characters and Classifications of protozoa up to Classes
- Locomotory Organelles
- Locomotion in Protozoa.
- Viruses- a Border Line Case between Living and Non Living things.
- Acellular and Cellular Organisms
- Prokaryotes and Eukaryotes
- Biology of Flagellated Protozoans, Amoeboid Protozoans, Spore Forming Protozoans, Ciliated Protozoans and Parasitic Protozoans

Unit- 2:

- Body Organisation
- Characterisitic of Metazoa
- Symmetry: Asymmetrical, Spherical, Radial, Biradial, Bilateral
- Development patterns – Cleavage, Fate of Blastopore and Germ Layers
- Body Cavity – Pseudocoelom and Coelom
- Origin and Evolution of Metazoa
- Syncytial theory, Colonial Theory, Polyphyletic Theory

Unit-3:

- General Characteristics and Classification of Porifera, Cnidaria, Ctenophora, Platyhelminthes and Nematoda coral reefs, polymorphism in celentorates

Unit-4:

- Characteristic features and Classification of Annelida , Arthropoda, Mollusca
- Torsion and Detosion in molnsca.
- Echinodermata- Laval forms in Echinodermata

Unit-5:

- Comparative Forms and Functions
  - Locomotion : Significance of Hydraulic Pressure in Locomotion, Locomotion in Coelenterates, Flatworms, Nematoda, Annelida & Arthropoda
  - Mollusca – Foot in mollusa as a Creeping and Crawling organ, burrowing Organ , Leaping organ and Swimming organ
  - Ambulance system in Echinodermata
  - Feeding and Digestion in Sponges, Coelenterates
  - Structure and function of Protonephridia , Metanephridia, MalpighianTtubules and Coelomoducts of Molluscs

Unit-6:

- Respiratory System – Respiratory organs, Process of Respiration , Respiratory Pigments
- Circulatory System – Open and closed type of Circulatory System
- Organosation of Nervous System – Nerve Cell , Neuroglia , Ganglia
- Nervous Syatem in Platyhelminthes , Annelida , Arthropoda and Mollusoa

Unit-7:

- Reproductive Sytsem – Formation of Special Reproductive Unit
- Asexual Reproduction – The Gemmules, Regeneration, Autotomy and Regeneratio
- Epitoky, Polarity and Regeneration
- Prevalence and its Significance
- Sexual Reproduction and its Patterns. Sexual Dimorphism, The Reproductive Organs
- Mating and Fertilization, Ovipary , Vivipary , Ovovivipary , Hermaphroditism
- Parthenogenesis and Metagenesis

Unit-8:

- Adaptations and Behavioural Patterns
    - Colonial forms among Protozoans and Metozoans
    - Adaptive Radiations in Annelida , Arthropoda and Mollusca
    - Flight in Insects , Migration in Insects

UNIT-9:

- Social organization in insects – Advantage and disadvantage of Social Behavior
- Kinds of Honey Bees , Production of Honey, Composition of Honey, Honey Production in India
- Industrial Products – Silk , Lac, Bees Wax, Pearl, Sponge , Dyes and Pigments

Unit-10:

- Parasitic PLatyhelminthes – Nematoda
- Parasitic Nematoda
    - Economic importance of Arthropods : in agriculture, soil facility, pollination, post management, food chain, scavenger

UGZY-103
Genetics and Cell Biology

Unit_1:

- Genetic Variation, Molecular basis of genetic information
- Human Chromosomes and Human Chromosomal Abnormalities
- Sex Linkage and Determination in Drosophila and Man
- Sex Chromatin Bodies
- Dosage Compensation and Lyon's hypothesis

Unit-2:

- Blood group and haemoglobin, Genetics in Man Inborn Errors of Metabolism in Man
- DNA and RNA structure
- Harchey chase experiment
- Replication of DNA – Messelson and Stahl's Experiment

Unit-3:

- DNA Polymerase and *in Vitro* DNA synthesis
- Transcription
- Genetic Code
- Gene Cloning Experiment

Unit-4:

- Definition and history of Cell Biology
- Microscopy – Light Microscopy and Electron Microscopy (Fundamental of TEM and SEM)
- Principle of Fixation, Staining and Autoradiography

Unit-5:

- Cell Cycle – Mitosis and Meiosis , Nucleus , Nuclear Membrane and Nucleolus
- Structure and Function of Plasma Membrane (Passive Transport and Active Transport)

Unit-6:

- Endoplasmic Reticulum – Morphology, Ultrastructure
- Types of Endoplasmic Reticulum
  - Smooth ER and Rough ER
  - Origin of ER
  - Function of ER
- Ribosomes – Occurrence and Distribution
- Types Of Ribosomes
  - 70s Ribosomes
  - 80s Ribosomes
- Structure of Ribosomes
- Dissociation and Reconstitution of Ribosomes

Unit-7:

- Golgi Body – Occurrence , Distribution , Morphology , Chemical Composition , Origin and Function
- Lysosomes – Chemical Composition , Lysosomal Enzymes , Lysosomal Membrane
- Kinds of Lysosomes – Primary and Secondary Lysosomes
- Origin and Function of Lysosomes
- Lysosomes and Disease

Unit-8:

- Origin of Mitochondria
- Mitochondria – Morphology, Chemical Composition
- Function of Mitochondria
- Mitochondria as Semi Autonomous Organelles

UGZY-104

Hemichordata and Chordata

Unit-1:

- Hemichordata-
  - General Characters of Hemichordata and Affinities of Balanoglossus
- Cephalochordata-
  - Classification and Detailed Study (Habits, Morphology, Anatomy and Physiology) of *Branchiostoma*

Unit-2:

- Urochordata-
  - Classification and Detailed Study (Habits, Morphology, Anatomy, Physiology and Post Embryonic Development) of *Herdmania*

Unit-3:

- Pisces-
  - Classification and Detailed Study (Habits, Morphology, Anatomy and Physiology) of *Scoliodon*
  - General Characters and Classification of Amphelia and reptilian up to Order with examples

Unit-4:

- General Characters and Classification of aves up to Order with Examples, Flying Adaptations in birds

Unit-5:

- Comparative Anatomy of Vertebrates-
  - Histology , Comparative Study Of Integument And Skeleton

Unit-6:

- Digestive System-
  - Brief Account of Alimentary Canal And Digestive Glands in vertebrates
- Respiratory System-
  - Brief Account of Gills and Air Sacs, Swim Bladder

Unit-7:

- Circulatory System-
  - Evolution Of Heart And Aortic Arches in vertebrates
- Urinogenital System-
  - Succession Of Kidney , Evolution Of Urinogenital Ducts

Unit-8:

- Nervous System-
  - Comparative Account Of Brain
- Sense Organs-
  - Types Of Receptors

DCEZY-105
Animal Distribution And Ecology

Unit-1:

- Animal Distribution – Geological and Geographical Distribution of Animals , with their Characteristic Fauna

Unit-2:

- Fossils
- Barriers and Dispersals

Unit-3:

- Ecology – Definition, Branches of Ecology , Significance of Ecology For Man
- Growth of Animal Ecology,
- Desert Ecology
- Pollution Ecology

Unit-4:

- Various Zone of Atmosphere
- Hydrosphere (Water) – Physical and Chemical Properties Of Water
    - Effect of Factor of Aquatic Environment On Aquatic Organisms
- Lithosphere (Soil) – Process of Soil Formation
    - Soil Types, Morphology of Soil
    - Physical and chemical, Properties of Soil
    - Soil Fauna and Flora

Unit-5:

- Ecological Environment, Factors (Biotic and abiote) and Limiting Factors
- Component of Ecosystem , Tolerance Range And Limiting Factor , Tropic Level

Unit-6:

- Ecological Pyramids
- Energy Flow
- Food Chain and Food Web
- Biogeochemical Cycle

Unit-7:

- Population Dynamics – Density , Natality , Mortality , Age Distribution , Population Distribution
- Population Growth – Factors Affecting Biotic Potential , Carrying Capacity
- Population Regulation

Unit-8:

- Adaptation of Animals In Deserts and Fresh Water

Unit-9:

- Wildlife Conservation – Defining Wildlife , Treats to Wildlife , Measures For Conservation of Wild Life

DCEZY -106
Taxonomy and Evolution

Unit-1:

- Principle of Systematics and Taxonomy
- Biological Species Concept
- Taxonomy practices

Unit-2:

- Evidences of evolution from classification (taxonomy),
- Comparative anatomy, connecting link, homology, analogy and vestigial organ

Unit-3:

- Evidences of evolution from comparative embryology,
- comparative physiology and biochemistry

Unit-4:

- Objectives of classification, Theories of classification, grouping and ranking, diversity of individuals, principle of hierachy, population taxonomy, information retrival

Unit-5:

- Taxonomic and non-taxonomic attributes, morden concepts in taxonomy.

Unit-6:

- Definitions, Uses and application of international code of zoological nomenclature

Unit-7:

- *Elementary statistics, Mean, Median and Mode, Measures of dispersion variation, Standard deviation)*

Unit-8:

- *Origin of life, synthetic theory of evolution, selection , mutation, migration, genetic drit, mimicry isolation and speciation*

SBSZY-03

Economic Zoology and Environment Biology

Unit-1:

- Protozoa-
  - Protozoan Parasitic Diseases Of Man And Domestic Animals With Special Reference To Zoonotic Significance Of Entamoeba histoltica Plasmodium
  - Protozoa And Soil Fertility

Unit-2:

- Platyhelminthes-
  - Life Cycle And Zoonotic Significance of Diphyllobothrium latum
- Aschelminthes-
  - Life Cycle And Zoonotic Significance of Dracunculus medinensis

Unit-3:

- Arthropoda-
  - Life Cycle And Zoonotic Significance of Representation Tick And Mite
  - Beneficial And Harmful Insects

Unit-4:

- Plant And Stored Grain Pests And Role of Insecticides In Their Control
- Interrelationship of Mosquito With Malaria , Yellow Fever , Dengue , Encephalitis And Dermatobia , Their Prevention And Control
- Biological Control of Insect Pests

Unit-5:

- Aquaculature-
  - Its Basic Concepts , Management and Economics(Including Pearl Fishery)

Unit-6:

- Air Pollution-
  - Nature of Pollutants , Their Sources and Effects On Humans , Plants And Animals And Their Control

Unit-7:

- Water Pollution-
  - Sources , Consequences And Control
- Soil Pollution-
  - Sources , Nature And Harmful Effects

Unit-8:

- Evironmental Health –
  - Animal In Relation To Human Health
  - Water In Relation To Human Disease
  - Urbanisation Stress And Health
  - Behaviour Patterns Of Health And Disease

UGZY-108
Developmental Biology

Unit–1:

- **Asexual Reproduction** : The Morphogenetic Processes And The Stages (Blastema ,Blastogenesis ,And Blastozooides), The Kinds (Fission , Budding , Gemmule Formation) And Comparion Between Blastogegesis And Embryogenesis

Unit-2:

- **Sexual Reproduction :** Gametogenesis (Spermatogenesis And Oogenesis) Maturation Of Gametes : Vitellogenesis

Unit-3: Parthenogenesis :

Unit-4: Metamorphosis : The Morphogenetic Processes And Cauation In Amphibians And Insects , Tissue Reactivity

Unit-5: Induction Process , Factors Controlling Moulting In Insect

Unit-6: Regeneration : The Morphogenetic Process In Regeneration ,Ability Of Regeneration In Different Group Of Animal , Amphibian Limb Regeneration

- Regeneration In Hydra , Histology Of Regeneration Process (Metaplasia) Field, Polarity And Gradient , Factors Influencing Regeneration (Stimulation , Suppression)

Unit-7: Growth And Ageing : Concept Of Growth , Degrowth And Cell Death , Mechanism Of Growth

Unit-8: Growth Curve And Their Interpretation , Type Of Cell Growth , Ageing

DCEZY -109

Molecular Biology & Genetic Engineering

Unit-1

Eukaryotic genome and its organization, unique and repetitive DNA, recombination and chromosome mapping in bacteria and virus, Molecular basis of gene regulation in prokaryotes inducible repressible system.

Unit-2:

- Introduction to Basic Concepts In Immunology
- Components of Immune System
- Principles of Innate and Adaptive Immune System
- Haemopoeisis
- Cells of Immune System and Organs(Primary And Secondary Lymphoid Organs)of The Immune System

Unit-3:

- Basic Properties of Antigens
- B And T Cells
- The Immune System and disease, HIV
- Antigen Antibody Interactions as Tools for Research and Diagnosis

Unit-4:

- Gene Regulation in Heterokaryons and Somatic Cells
- Somatic Hybridization And Studies In Malingnancy
- Antibodies-
- Structure, Classes And Functions Of Antibodies
- Monoclonal Antibodies
- Structure And Function Of MHC

Unit-5:

- The Immune System And Disease
- General Introduction To Vaccines
- Various Types Of Vaccines

Unit-6:

- Scope of Genetic Engineering
- Restriction Enzymes And Their Uses In Gene Cloning
- Nucleotide Sequencing Isolation And Ananlysis Of mRNA and cDNA Probes and Their Synthesis

Unit-7:

- In Vitro Synthesis of Recombinant DNA And Gene Cloning Techniques
- Non Coding Intervening Sequences Within Eukaryoticgenes
- Application Of Recombinant DNA Technology
- Microinjecting Gene Into Animal Oocytes , Eggs And Embryos