PG Programme Specific Outcome (PG)
Programme: P.G. Zoology

PSO-1-To acquire complete in-depth knowledge in the specific areas of functional Biology of Invertebrates and chordates like organization of coelom, different mode of respiration and its mechanism, regulation of respiration, transport of gases, organs of excretion and mechanism of excretion and osmoregulation, thermoregulation, muscle contraction, neurotransmitter and acoustic lateral system and electro reception of aquatic vertebrates.

PSO-2-To understand the bio-membrane composition, models, transport through bio-membrane, different types of cytoskeletons, DNA replication in prokaryotes and eukaryotes, DNA damage and repair mechanism, transcription in prokaryotes and in eukaryotes and processing of primary transcript and RNA editing in eukaryotes, translation machinery, genetic code, prokaryotic and eukaryotic translation and intracellular trafficking.

PSO-3-To use their in-depth knowledge about organization of prokaryotic and eukaryotic chromosome, microbial genetics, cell cycle and its molecular basis of cellular checkpoints, sex determination and doze compensation in *C. elegans*, Drosophila and mammals, techniques and methods in genetic like DNA sequencing, amplification, fingerprinting and genome expression analysis.

PSO-4-Students will be able to explain squash preparation using Chironomus /drosophila larva for polytene chromosome, onion root tip for mitosis and grasshopper testis for meiosis, enumeration of RBC, WBC and preparation of histological slide and cytological slide, identification of invertebrate and vertebrate slide, analysis of statistical data of genetics.

PSO-5-To make students aware about abiotic and biotic factor, energy flow, biogeochemical cycle, hydrological cycle, principal pertaining to limiting factors, population growth, predation and regulation, global environmental issue, wild life conservation and pollution biology.

PSO-6: To make student aware about the principle and uses of different analytical instruments and different microscopy, separation techniques, immunological techniques, different rules and tests of biostatistics.

PSO-7: To make student aware about the bioenergetics of living beings, biochemistry of carbohydrate proteins, lipids and enzymes, different general principles of fixation and types of fixatives, staining and types of dyes, principles of histochemistry of different biomolecules.

PSO-8: To make student aware about the biosystematics, definition, different hierarchy of category, classification of species concept, ICZN, trends in taxonomy, genetic polymorphism, natural selection, molecular evolution, mechanism of speciation and different principles of population genetics and its related terms.

PSO-9: To make student aware about the different biochemical experiments like salivary amylase activity, glucose, urea, uric acid, separation of amino acids and biochemical detection of starch glucose protein and lipids, identify and comments upon archeopteryx, Darwin`s finches, serial homology, analogy and adaptive radiation, histochemical demonstration of different reagents, preparation of temporary mounts, measurement of different physiochemical factors and use of statistics in biology.

PSO-10: To make student aware about the innate and acquired immunity and its function, nature of antigens, MHC complex, structure and function of antibodies, antigen antibody interaction and its complementation, ELISA, Cytokines, organization and expression of Ig genes, hypersensitivity autoimmunity immune response to infection agents and immunodeficiencies.

PSO-11: To make student aware about the gamete biology multiple ovulation and embryo transfer technology assisted reproduction technologies, basic concept of development differentiation morphogenesis and organogenesis and stem cell biology.

PSO-12: To make student aware about the aims and scope of endocrinology, different types of endocrine gland, their hormones, neuroendocrine systems and neurosecretion, hypothalemic control of endocrine system, different hormones involved in reproduction and reproductive cycle, biosynthesis of steroid, amino acid derived and simple peptide hormones. Hormone receptors and general principles of hormone actions.

PSO-13: To make student aware about the basics of animal, social and reproductive behavior, biological rhythms and control of behavior,

PSO-14: To make student aware about the determination of blood group, preparation of blood film ad identification of blood cells and hormonal assessment of T3 testosterone, estrogen, to aware about endocrinological and embryological slides, preparation of permanent mount of chick embryo and behavioral aspects of different specimens.

PSO-15: To make student aware about the taxonomy, evolution, anatomy, physiology and endocrinology of fish. Fresh water aquaculture, fish pathology, fish biotechnology, fisheries resources and post-harvest technology.

PSO-16: To make student aware about the oxygen consumption in relation to body size, hematological analysis and estimation of different aquatic physiochemical parameters, slide preparation, mounting process, taxonomic identification of local available fishes, biological analysis of planktons in macrophytes, fish parasites and identification of different stage of fishes.

PSO-17- To get knowledge about the Gandhian approach towards social and environmental moral values and concept of swachhata and its relation to moral upgradation of society.

PSO-18: To make student aware about the environment meaning and components, introduction to environmental laws in India, constitutional provisions, general principles about environmental law precautionary principle.

PSO-19: To make student aware about the Get thorough knowledge about variety of moral issues, principals of ethics and morality including Harmony in the Society, integrity, work ethics Duties and Right of employees and employers. Understand about the Holistic approach to corporate ethics like Vedantic Ethics, Intellectual property Rights, Social audit and ethical investing.

PSO-20: To make student aware about the Understand the concept and various kinds of rights. Learn about the magna carta and international bill of rights and learn about diversity, multiculturalism like value of diversity and beyond universal human rights

Course outcome: Semester- I

P.G. Zoology

CC- 1: Functional Biology of Invertebrates and Chordates

CO1 : Get an in-depth understanding about Organization of coelom and its significance, patterns of feeding and digestion in invertebrates and types and significance of invertebrate larvae.

CO2 : Understand about Respiratory pigments, Respiratory organs and Mechanism of Respiration in Invertebrates.

CO3 : Learn about various kinds of Respiratory organs in vertebrate, exchange and transport of gases their blood, neural and chemical regulations of respiration and respiratory adaptations at higher altitude and in diving mammals.

CO4**:** Knowledge about structure and function of excretory systems and mechanisms of excretion and osmoregulation in aquatic and terrestrial animals and mechanism of acid-base balance.

CO5: Acquire a thorough understanding of Thermoregulation, Muscle contraction, Neurotransmitters and Acoustico-lateral system and electroreception in aquatic vertebrates.

CC- 2: Molecular Cell Biology

CO1: Get thorough knowledge about the molecular composition, arrangement and functional consequences, models and various transport across bio-membrane.

CO2(B): Understand about the structure and dynamics of microtubules and microfilaments, role of Kinesin and Dynein in intracellular transport, axonal transport and cell movement.

CO 2: Have a deeper understanding of DNA replication in prokaryotes, eukaryotes and virus and DNA repair mechanisms.

CO 3: Demonstrate the profound understanding of the process of transcription in prokaryotes and eukaryotes, processing of primary transcript and RNA editing in eukaryotes.

CO4: Detailed Knowledge about the genetic code and mechanisms of translation in prokaryotes and eukaryotes.

CO5: Learn about the targeting proteins to ER, Co and Post translational modification of proteins and trafficking mechanisms**.**

CC- 3: Genetics

CO1: Understood about the organization of prokaryotic and eukaryotic chromosome and nucleosome, organization of centromere and kinetochore. Organization of telomere and its maintenance, heterochromatin, types, organization and its significance, polytene and Lampbrush chromosome.

CO2: Well versed about the microbial genetics like transformation, conjugation, transduction, and sex-duction, linkage map in bacteria and molecular mechanism of recombination.

CO3: Get thorough understanding about cell cycle, its stages, regulations of check points, molecular basis of checkpoints and CDKs.

CO4: Get Knowledge about sex determination and dosage compensation in *Coenorhabditis elegans*, Drosophila and Human**.**

CO5: Well versed about the Procedures of DNA sequencing via different methods, DNA amplification through PCP, DNA fingerprinting as VNTR, STR, mitochondrial and SNP profiling and various genome expression analysis using blotting experiments, RT-PCR and DNA Microarray.

CC- 4: Practical

CO1: Student will gain on hand experience about a squash preparation using *Chironomus larva*, onion root tip for mitosis and mitotic index, grasshopper tests for meiosis and related features.

CO2: Knowledge about enumeration of RBC and WBC, histological slide preparation of an invertebrate larva.

CO3: Acquired knowledge about genetics after solving problems on mendelian principles and sex-linked inheritance, pedigree analysis in human.

CO4: preparation of linkage map based on data from Drosophila crosses and tetrad analysis in Neurospora.

CO5: Knowledge about how to prepare class records charts models etc.

Elective Courses (AECC-1) Semester -1
Environmental sustainability
Swachha Bharat Abhiyan activities

EC1: Get thorough knowledge about environmental ethics and ecosystem including concept of sustainable development with reference to human values in western and Indian perspective, sustainable development and conservation of natural resources.

EC2: An overview of the environmental stresses and their management, development and its effect on environment, environment pollution industrial civilization, global warming acid rain ozone layer depletion, menace of encroachment of exotic plants.

EC3: Understand about concept of bio diversity and its conservation like environmental degradation and government policies, role of science in conservation of environment and concept of three `R`.

EC4: Learn about Gandhian approach towards social and environmental moral values and concept of swachhata and its relation to moral upgradation of society, role of `swachchagrahis`, sanitation and hygiene, concept of community, infectious and by vector borne diseases and their spread.

EC5: Learn about writing of assignment practical filed works based on above.

Semester- II
CC- 5: Environmental Science

CO1: Learn thorough about abiotic, biotic factors, energy flow and its models, biogeochemical and hydrological cycle.

CO2: Concept development about law of limiting factor including, factor compensation and their ecotypes.

CO3: Get thorough understanding about demography and population growth, population regulation including its extrinsic and intrinsic mechanism, concept of niche, niche width and overlap, fundamental and realized niche.

CO4: Understand about the Global environmental issues, wildlife conservation, IUCN, CBD, CITIES, national parks, sanctuaries wild life protection acts and biosphere reserves.

CO5: Get thorough understanding about pollution, its classification, causes, effects, control, Biomagnification, Eutrophication, thermal and radioactive pollution, emerging pollutants like POPs and Pharmaceuticals, bio-indicators as index of pollution and their significances.

CC- 6: Bioinstrumentation & Biostatistics

CO1: Knowledge about principles of instruments like pH Meter, spectrophotometer, colorimeter, ultracentrifuge, light, compound microscope, phase contrast, confocal and electron microscopes.

CO2(A): Get thorough understanding about SDS-PAGE, Agarose gel electrophoresis, GLC, HPLC, Flow cytometry, density gradient centrifugation.

CO2(B): Students can implement the technical gain of RIA, ELISA for their pathological lab. establishment

CO3: Provide basic concepts of Biostatistics mean standard deviation a standard error analysis of variance and ANOVA.

CO4: Understand rules of probability correlation regression and test of significance.

CO5: Knowledge of rules of probability, binomial, Normal and poission probability distribution, Chi square test and student`s test.

CC- 7: Biochemistry

CO1: Thorough knowledge of Laws of thermodynamics, internal energy, Enthalpy, Entropy, concept of free energy, energy rich compound, mitochondrial electron transport chain and oxidative phosphorylation.

CO2: Understand the structure, types and properties of carbohydrates, metabolism of carbohydrate through glycolysis, HMP shunt, glyconeogenesis and glycogenolysis.

CO3: Get thorough understanding about all kinds of protein including its domain structures, peptide conformation, biosynthesis of urea, fatty acids synthesis and importance and beta oxidation of long chain fatty acids.

CO4: Learn about the classification and nomenclature of enzyme, their mechanism and kinetics feedback and allosteric inhibition, free radicals, antioxidants and detoxification.

CO5: Well versed about the principles and types of fixatives, types of dyes and principles of staining, general principles of histochemistry of various biomolecules.

CC- 8: Biosystematics and Evolution

CO1: Provide basic concept of bio systematics and taxonomy, its importance and application in biology, species concepts, ICZN, Zoological nomenclature, trends in taxonomy.

CO2: Student will get knowledge of genetic polymorphism, variation in chromosome structure, protein structure concept of natural selection, which includes Darwinian and neo-Darwinian and mode of natural selection operation.

CO3: Acquire knowledge of molecular evolution, molecular phylogenesis, Rates of molecular evolution and molecular clock, neutral theory of molecular evolution and origin of new genes and evolution of multi gene family.

CO4: Understand about pattern and mechanism of reproductive isolation and its role in evolution, sympatric and allopatric models of speciation.

CO5: Students learn about the concept of gene pool, allele frequency and genotype frequency, hardy Weinberg principles and its mathematical derivation, different principles and laws of destabilizing force of genetic equilibrium like population genetics, natural selection, meiotic drive and genetic drift.

CC- 9: Practical

CO1: Understand about biochemical experiments like determination of salivary amylase activity, colorimetric estimation of glucose, urea and uric acid, and separation of amino acids by paper chromatography, biochemical detection of different biochemicals.

CO2: Understand about identification and its evolutionary significance of archeopteryx, Darwin`s finches, serial homology in prawn, homology and analogy and adaptive radiation in beaks of birds.

CO3: Learn about the histochemistry of reagents like PAS, Alcian Blue, Sudan Black, methyl green-Pyronin, Mercury bromophenol and preparation of temporary mount.

CO4: Gain knowledge about the estimations of environment parameters like pH, dissolved oxygen, free CO_2, carbonate and bicarbonate alkalinity, total hardness and biodiversity in grass land arid and wet land.

CO5: Gain practical knowledge of standard deviation, standard error and correlation, regression t- test.

Elective Courses (AEC-1) Semester -II
Environmental law and policy

EC1: Understand about environment meaning and components, introduction to environmental laws in India, constitutional provisions, general principles about environmental law precautionary principle.

EC2: Understand about the forest wildlife and biodiversity relates laws including colonial forest policies statutory framework on forest wildlife and biodiversity IFA 1927, WLPA 1972 Biological diversity act 2002, strategies for conservation of dolphin, tiger elephant, rhino.

EC3**:** Learn about the air and water laws including national water policy, laws relating to prevention of pollution, access and management of water, pollution control boards, ground water and lay, legal framework on air pollution.

EC4**:** Knowledge about the environment protection laws and large products like legal framework on environment protection, marine laws of India, coastal zone regulation wetland conservation.

EC5**:** Understand about judicial remedies and the role of national green tribunal including role of judiciary in environmental protection, infrastructure project and India judiciary.

Semester- III

CC- 10: Vertebrate Immunology

CO 1- Understand the basic mechanisms of innate and adaptive immunity, its cell type, lymphocyte trafficking, phagocytosis and inflammation, humoral immunity and cell mediated immunity.

CO 2- Knowledge about the antigenicity, immunogenicity, B and T cell epitopes and haptens, super antigen, antigen processing and presentation, MHC complex and structure and functions of antibodies.

CO 3- Understand the antibody affinity and avidity, precipitation and agglutination reactions, descriptive knowledge of complement system, ELISA and descriptive knowledge of cytokines.

CO-4-Conceptualization of regulation of immune response the organization and expression of Ig genes, antibody diversity, BCR and TCR.

CO-5 Describe basic experimental methods and technological integrated knowledge of each subsystem to see their contribution to the functioning of higher-level systems in health and disease including basis of vaccination, autoimmunity, immunodeficiency, hypersensitivity and tolerance.

Core Course (CC- 11): Gamete and Developmental Biology

CO1: This course will help the students to understand the mechanisms involved for the development of zygote.

CO2: Learn about multiple ovulation and embryo transfer technology, *in vitro* condition and superovulation and assisted reproduction technologies like collection and preservation of gametes, ICST, GIFT and immuno-contraceptives.

CO3: Learn about basic concept of development like potency, commitment, specification, induction competence, determination and differentiation, morphogenetic gradients, cell fate and cell lineage, Genomic equivalence and cytoplasmic determinants.

CO 4: Get thorough Knowledge of cell differentiation. Organogenesis, Morphogenesis in Drosophila, gene amplification and rearrangement during development, Limb development and regeneration in vertebrates.

CO5: Learn a brief concept of stem cell, Its types, applications and therapeutic cloning.

CC- 12: Vertebrate Endocrinology

CO1: Understand aims and scope of endocrinology, hormones as messengers, hypothalamic control of endocrine system and chemical nature and gross features of hormones.

CO2**:** Learn the hormones involved in reproduction as seasonal and continuous breeder, hormone regulation of ovarian, menstrual and oestrus cycle.

CO3**:** Motivate students to learn biosynthesis of steroid hormones, amino acid derived hormones and simple peptide hormones.

CO4**:** Understand the beta adrenergic, insulin and steroid hormone receptors.

CO5**:** Get thorough knowledge about the second messenger concept like G protein, cAMP, cGMP, calcium calmodulin, lipid soluble and insoluble hormones and intracellular receptors and signalling.

CC- 13: Animal behaviors

CO1: Familiarize the learner to basics of animal behavior, ethology, patterns of behavior and approaches and methods in the study of behavior.

CO2: Learn about social behavior of insect, schooling in fishes, flocking in birds, social organization of primates, parental care in fishes and altruism.

CO3: Knowledge of evolution of sex and reproductive strategies, mating system, courtship and parental behaviors.

CO4: Learn about the biological rhythms like circadian, circannual, lunar, tidal and Epicycles, navigation and migration of fishes and birds.

CO5: Knowledge about the neural control of behaviors, hormones and behaviors, ecological aspects of behaviors as habitat selection, optimal foraging theory and aggressive behavior.

CC- 14: Practical

CO-1-Knowledge about determination of blood group using ABD antisera, blood film preparation, identification of blood cells of immunological importance, hormones assessment of T3/testosterone/estrogen by ELISA reader.

CO2**:** Learn about the identification of endocrinological and embryological slides.

CO3**:** Learn the preparation of permanent mount of chick embryo and identification of exposed endocrine glands in a mammal.

CO4**:** Well versed about the behavioral aspects regarding parental care and caste system in different animals, dance as means of communication in honey bees.

CO5**:** Learn about the identification of different embryonic stages.

Elective Course: AECC-2 (Semester-III)
Human values and professional ethics
Gender Sensitization

EC-1-Get thorough knowledge about variety of moral issues, principals of ethics and morality including Harmony in the Society, integrity, work ethics Duties and Right of employees and employers.

EC-2- Understand about the Holistic approach to corporate ethics like Vedantic Ethics, Intellectual property Rights, Social audit and ethical investing.

EC-3-Knowledge about Professional ethics like augmenting universal human order, characteristic of people friendly and eco-friendly productions, socially and ecologically responsible technologists and managers, mutually enriching institutions and organizations.

EC-4-Well versed about the gender including definition nature and evolution culture tradition historicity, gender-based division of labor, domestic work and use value.

EC-5-Knowledge about the gender justice and human rights international, constitutional and legal perspectives, media and gender, emerging issues and challenges.

Elective paper- Fish and Inland Fisheries (EC-1B)

EC1 (A): Learn details about taxonomic and evolutionary aspects of fishes.

EC1(B): Learns about physiological aspects about fish like integument, alimentary canal, Acoustic lateralis system, Air bladder and its modification.

EC-II(A): Learn about mechanism of gill respiration accessory respiratory organs, sound production, excretion and osmoregulation and reproduction in fishes.

EC-II(B): Studied about fish endocrinology like pituitary, thyroid, adrenal glands, corpuscles of stanius and hepatopancreas.

EC-III: Gain knowledge about fish culture, construction and layout plan of different types of ponds and their management, role of physicochemical and biological factor in aquaculture, aquatic weeds and their control, pen and cage culture, collection and transport of fish seeds, fish food organism, pollutants and their effects on fisheries.

ECIV(A): Student get knowledge about nutritional diseases, intrinsic disease, bacterial, fungal, viral and parasitic diseases in fish and their control.

ECIV(B): Understands about cryopreservation of fish gametes, induced breeding, androgenesis, gynogenesis and transgenic fish, cytogenetical techniques in aquaculture and integrated fish farming.

ECV(A): Students get familiar with fisheries resources of India, reservoir, estuarine and lacustrine fisheries in India.

ECV(B): An overview of post-harvest technique like principles and methods of inland fishing crafts and gears, fish spoilage and methods of fish preservation, fish byproducts and fish marketing.

GENERIC ELECTIVE COURSE (GE)
HUMAN RIGHT (SEMESTER -IV)

EC1: Understand the concept and various kinds of rights.

EC2: Learn about the magna carta and international bill of rights.

ECIII: Learn about diversity, multiculturalism like value of diversity and beyond universal human rights

ECIV: Understands about the theories of human right like liberal perspective

ECV: Learn how to prepare assignment and field work based on above.