COURSE OUTCOMES

M.Sc. – Zoology

SEM - I		
Paper- 1	**Non-Chordates**	**Course code: PSZO101**
	The learner will be able to	
CO1	differentiate anatomical and physiological modifications of digestive and excretory systems of non-chordates like Protostomes and Deuterostomes	
CO2	differentiate anatomical and physiological modification in respiratory and circulatory systems of non-chordates like Protostomes and Deuterostomes.	
CO3	differentiate anatomical and physiological modifications of nervous systems, chemical co-ordination and reproductive systems of non-chordates.	
CO4	understand the evolution of non-chordates and their phylogenetic relationships by means of paleontological evidences	
Paper- 2	**Developmental Biology – I**	**Course code: PSZO102**
CO1	The learner will understand the mechanism of fertilization and its molecular events in non-chordates as well as the process of formation of germ layers and coelom in animals and understand the difference in these processes between Protostomes and Deuterostomes.	
CO2	Learners will gain knowledge about the basic concepts and aspects of embryogenesis and stem cell therapy.	
CO3	Learners will understand the mechanism of early development and able to correlate the various differences observed in the pattern of embryonic development in non-chordates as well as the role of certain genes in early development	
CO4	Learners will acquire knowledge about the diversities in reproduction and development in invertebrates and the process of regeneration in lower animals Learners will understand how principles of developmental biology can be applied in forensics and Integrated Pest Management	
Paper- 3	**Genetics and Evolution**	**Course code: PSZO103**
CO1	The learners will understand the genetic analysis at the gene, genome and population level. The learner would realize the flow of genetic information and complex networking of genes in biological system leading to major phenotypic changes.	
CO2	The learner will understand the molecular processes that occur in and between the cells. The learner will gain insight in most significant molecular and cell based methods used to expand the understanding of modern Biology	
CO3	Learner will be able to gain knowledge of altruism, co-evolution and the racial distribution of animals in evolutionary time scale	
CO4	The learner will be able to apply evolutionary principles to research and understand aspects of evolution.	

	Learner will be acquainted with techniques of dating fossils and formation of fossils The learner will understand the concept of frozen zoo and will foster the need of hour for conservation of endangered species
Paper 4	**Frontiers in Zoology** **Course code: PSZO104**
CO1	Learners will get the introductory knowledge of emerging areas correlated with Zoology with particular respect to biological clocks and their importance
CO2	Leaner would be able to explain the basic principles, applications of the major imaging and DNA bar coding techniques
CO3	Learner will get acquainted with brain regions that form the basis of emotions and stress. Leaner will also understand the health problems caused due to prolong emotion and stress on the body.
CO4	The learner will understand current challenges of climatic changes and environmental issues Learner will understand the importance of the sustainable development
SEM -II	
Paper 1	**Chordates** **Course code: PSZO20**
CO1	The learner will gain knowledge of ancestry, morphology and phylogeny of protochordates.
CO2	The learner will gain knowledge of ancestry, morphology and phylogeny of chordates
CO3	Learners would understand evolution, morphology and phylogeny of chordates.
CO4	Learners would obtain additional knowledge of diverse characteristics of various chordates such as Retrogressive metamorphosis, evolutionary significance of Dinosaurs, flight adaptations & migation in birds
Paper 2	**Developmental Biology – II** **Course code: PSZO202**
CO1	The learner will gain knowledge of generalized morphological account of male and female reproductive systems and accessory structures in chordates.
CO2	The learner will gain knowledge of reproductive physiology and associated biochemistry in chordates.
CO3	The learner will gain knowledge of details of germ cell migration and understand the importance of forms and functions of stem cells and their medico-therapeutic applications
CO4	The learner will be acquainted with environmental impact on development and evolution of animals and will also get insights of aging and senescence.
Paper 3	**Biochemistry and Biotechnology** **Course code: PSZO203**

CO1	Learners will gain knowledge of the fundamentals of chemical basis of life and the structures, interactions, and importance of complex biomolecules and their significance in living system.
CO2	Learners will gain knowledge of the bioenergetics and metabolic pathways of various biomolecules and the regulatory mechanisms underlying various metabolic pathways.
CO3	Learners will gain knowledge of the processes and techniques used in development of biotechnology products as well as of the processes for harnessing the of living systems for betterment of mankind.
CO4	Learners will gain knowledge on the application of biotechnology in various fields such as industry, medicines, agriculture and environment
Paper 4	**Research Methodology** **Course code: PSZO204**
CO1	Learner will be able to formulate and execute research problem from the concept research design
CO2	The learner will be able to effectively organize and present the data in tabular and graphical form and choose correct statistical test. They perform statistical analysis indifferent fields of research using various computer programs.
CO3	The learner will be able to document and communicate their research in scientific journals, thesis and dissertations and research reports.
CO4	The learners will be able to understand the different laboratory animals that are useful as a model system
SEM - III	
Paper-I BASICS OF INDUSTRIAL & ENVIRONMENTAL BIOTECHNOLOGY-I Course code: PSZOBT301	
CO1	The learners will gain knowledge about the implications of recombinant DNA technology in food and microbial technology with respect to synthesis of novel antibiotics and amino acids
CO2	The learners will gain knowledge about design of bioreactors and fermenters & downstream processing for large scale production of novel products from recombinant microorganisms animal cell culture
CO3	The learners will gain knowledge about monoclonal antibodies & therapeutic applications Sub-unit vaccines as well as live recombinant & Attenuated vaccines
CO4	The learners will get insights regarding to biomass utilization, bioremediation, degradation of xenobiotic compounds & genetic engineering of biodegradative pathways.

Paper-II GENETIC ENGINEERING TECHNIQUES AND ITS APPLICATIONS Course code: PSZOBT302	
CO1	The learners will gain knowledge about the basic tools & techniques of genetic engineering such as cloning Vectors and analysis of genome and proteome
CO2	The learners will gain knowledge about promoters of gene expression in prokaryotes and expression of cloned genes in prokaryotes in order to synthesize novel therapeutic products in microbial system
CO3	The learners will gain knowledge about application of computers in biological sciences and databases as well as use of expressed sequence tags and single nucleotide polymorphisms in the detection of diseases.
CO4	The learners will gain knowledge about transgenic animals and their applications as well as tissue engineering, xenotransplantation and antibody engineering as human therapies.
Paper-III GENERAL, PHYSICAL, CHEMICAL AND BIOLOGICAL OCEANOGRAPHY Course code: PSZOOCN303	
CO1	The learners will gain knowledge about terminology of submarine topography as general understanding of typical oceanographic research vessel and its equipment.
CO2	The learners will gain knowledge about various physical properties of sea water and ocean circulations
CO3	The learners will gain knowledge about general composition of sea water, dissolved gases & nutrients for primary productivity
CO4	The learners will gain knowledge about sea as a biological environment & ecological sub-divisions of marine environment & effect of physical factors on marine life.
Paper-IV PLANKTOLOGY, FISH, FISHERY SCIENCE AND AQUACULTURE Course code: PSZOOCN304	
CO1	The learners will gain knowledge about various schemes of classification & adaptations of marine plankton as well as vertical & diurnal migration of zooplankton
CO2	The learners will gain knowledge about fish classification as per Francis Day and FAO sheets as well as major commercial fisheries with respect some teleosts, elasmobranchs, crustacean & Molluscan resource organisms.

CO3	The learners will gain knowledge about fish stock improvement through selective hybridization as well as gene transfer technology in fish & protocols of developing transgenic fishes.
CO4	The learners will gain knowledge about history, scope and importance of aquaculture as well as different systems and types of aquaculture.
SEM - IV	
Paper-I BASICS OF INDUSTRIAL & ENVIRONMENTAL BIOTECHNOLOGY II Course code: PSZOBT401	
CO1	The learners will gain knowledge about microbial synthesis of Organic acids, antibiotics, bacterial polysaccharides such as Dextran, Xanthan, Alginate & commercial biodegradable plastic.
CO2	The learners will gain knowledge about bio-transformations, Biocatalyst (enzyme) immobilization, enzymes in diagnostic assays & biosensors .
CO3	The learners will gain knowledge about nitrogen fixation - microbial insecticides-Bt toxins, Developing insect resistant, virus resistant & herbicide resistant plant.
CO4	The learners will gain knowledge about bioabsorption of metals, phytoremediation & its use in biotechnology and bioleaching of metals
Paper-II GENOME MANAGEMENT, MANIPULATION, REGULATIONS AND PATENTS IN BIOTECHNOLOGY Course code: PSZOBT402	
CO1	The learners will gain knowledge about the Basic tools of genetic engineering, cloning vectors and various blotting techniques
CO2	The learners will gain knowledge about eukaryotic gene expression, cultured insect cells expression systems & mammalian cell expression systems.
CO3	The learners will gain knowledge about restriction fragment length polymorphism (RFLP), mapping human diseases, positional cloning with reference to a disease causing gene.
CO4	The learners will gain knowledge about patenting biotechnology inventions, Human gene therapy and regulation of environmental release of genetically engineered organism.
Paper-III GENERAL, PHYSICAL, CHEMICAL AND BIOLOGICAL OCEANOGRAPHY Course code: PSZOBT403	
CO1	The learners will get insights from studying how various oceanographic instruments works for collection of various samples and data apart from oceanographic Expeditions & the international law governing seas and oceans

CO2	The learners will get knowledge about the vertical circulation, waves, tides and ocean currents
CO3	The learners will get knowledge about impact of anthropogenic activities such as various kinds of pollution-affecting marine life and possible reclamation procedures.
CO4	The learners will get knowledge about various mineral resources including bioactive compounds from the sea as well as scientific and economical aspect of seabed exploration
Paper IV: PLANKTOLOGY, FISH, FISHERY SCIENCE AND AQUACULTURE Course code: PSZOOCN404	
CO1	The learners will get thorough understanding about marine bio-deterioration such as fouling and boring organisms & marine algae and plankton abundance in relation to fisheries
CO2	The learners will get thorough understanding about various aspects of fish population dynamics They will get exposure to socio-economic condition of fishermen
CO3	The learners will get knowledge about various statistical methods such as correctional analysis of length and weight and other morphometric measurements and biometric indices of fish.
CO4	The learners will get knowledge about hatchery and grow out practices for cultivable species of freshwater fishes & breathing fishes as well as integrated aquaculture and sewage fed fishery & culture of brackish water fishes.