

Program Name: **B. Sc. Zoology**

### **Program specific Outcomes**

A student completing this program will be able to

**PSO1** Build a reliable foundation of all allied subjects of Zoology, besides pure Zoology itself.

**PSO2** Link Zoology to various fields in real life, viz., Parasitology, Entomology, Fisheries, etc.

**PSO3** Student will be able to recognize and appreciate the plethora of fields into which he/she can progress onto, after graduation, viz., Biochemistry, Biotechnology, Bioinformatics, Toxicology, Food & Nutrition, Agriculture, Ethology, Parasitology, Environmental Science, Wildlife, Fisheries, Entomology, etc.

**PSO4** With the fundamental knowledge of applied Zoology subjects like Poultry Science, Sericulture, Apiculture, Fishery Science, Wildlife, etc., a zoology student can develop a STARTUP of their own.

**PSO5** Create employability, skill development and entrepreneurship.

### **Course outcomes for all courses offered by the department:**

<b>Semester</b>	<b>Course code</b>	<b>Course name</b>	<b>Course Outcomes Student completing this course is able to</b>
1	ZO-1501	Basics of Zoology-I	<b>1:</b> understand human urinary system <b>2:</b> understand single celled animals and their habits <b>3:</b> Grasp the basics of CYTOLOGY, starting with the most basic instruments like Light Microscopes, the fundamental structure of a typical Animal cell, diversity in animal cells and a couple of important organelles <b>4:</b> study structure of gene and related terminology <b>5:</b> understand basic principles of genetics and its deviations
1	ZO-1502L	Basics of Zoology Practicals-I	<b>1:</b> learn urine analysis by performing biochemical tests <b>2:</b> learn amoeba's anatomy and its habits so as to get general idea of protozoans <b>3:</b> Whatever the students have learnt about CYTOLOGY in theory, they will understand the same practically <b>4:</b> understand pattern of inheritance different from Mendelism

			<p><b>5:</b> apply knowledge of genetics in problem solving</p> <p><b>6:</b> study animal tissue culture laboratory instruments</p>
2	ZO-2501	Basics of Zoology-II	<p><b>1: CO1</b> study the structure and functions of blood</p> <p><b>2: CO2</b> have profound knowledge of organic evolution as they will understand the process of origin of life and how variations and mutations are operated by natural selections.</p> <p><b>3: CO3</b> have profound knowledge and understanding of Hydra as an animal type.</p> <p><b>4: CO4</b> Continuing from what they have grasped about the basics of CYTOLOGY during their Sem-1, the students will progress further by studying some more advanced instruments like TEM, SEM and Centrifuges alongwith some more organelles like Ribosomes, Mitochondria and Golgi complex.</p> <p><b>5: CO5</b> study Human genetics</p> <p><b>6: CO6</b> understand Non-allelic gene interaction</p> <p><b>7: CO7</b> understand applications of animal biotechnology</p> <p><b>8: CO8</b> Knowledge of requirements for animal tissue culture</p>
2	ZO-2502L	Basics of Zoology Practicals-II	<p><b>1:</b> learn practical aspects of haematology</p> <p><b>2:</b> have profound knowledge of organic evolution as they will understand the process of origin of life and how variations and mutations are operated by natural selections.</p> <p><b>3:</b> practically understand various structural details of <i>Hydra</i> by observing it and its different parts under microscope.</p> <p><b>4:</b> Whatever the students have learnt about CYTOLOGY in theory, they will understand the same practically.</p> <p><b>5:</b> understand pattern of inheritance different from Mendelism</p>

			<p><b>6:</b> apply knowledge of genetics in problem solving</p> <p><b>7:</b> study laboratory set up of animal tissue culture laboratory</p>
3	ZO-3501	Animal Diversity (Nonchordates) and Genetics & Animal Biotech	<p><b>1:</b> understand ancient as well as modern trends of Invertebrate classification by which they could distinguish and compare different characters across various Invertebrate taxa.</p> <p><b>2: CO2</b> understand characteristics of invertebrate animals as well as their affinities with one another.</p> <p><b>3: CO3</b> imbibe anatomy of earthworm and will have general idea of annelids</p> <p><b>4: CO4</b> study human chromosomal aberrations and related abnormalities</p> <p><b>5: CO5</b> gain knowledge of extranuclear inheritance</p> <p><b>6: CO6</b> be introduced to modern methods of tissue preservation</p> <p><b>7: CO7</b> know advantages and disadvantages of animal tissue culture</p>
3	ZO-3502	Animal Diversity (Chordates), Cytology and Human Histology	<p><b>1:</b> describe general taxonomic rules on animal classification.</p> <p><b>2:</b> classify phylum Protochordates to Mammalia</p> <p><b>3:</b> understand the distribution of fauna</p> <p><b>4:</b> differentiate between nonchordates and chordates</p> <p><b>5:</b> distinguish between venomous and nonvenomous snakes</p> <p><b>6:</b> understand anatomy of cartilaginous fishes (Shark)</p> <p><b>7:</b> further enhance their understanding of CYTOLOGY.</p> <p><b>8:</b> study structure of human lung, bone and cartilage</p>
3	ZO-3503L	Zoology Practicals	<p><b>1:</b> have profound understanding of invertebrate animals as they will be able to identify and classify representatives animals from Invertebrate phyla.</p> <p><b>2:</b> study the organ systems of Earthworm</p>

			<p><b>3:</b> Whatever they have learnt about CYTOLOGY in theory, the students will understand the same practically.</p> <p><b>4:</b> study autosomal and sex-chromosomal abnormalities in Human</p> <p><b>5:</b> comprehend about the basic instrumentation of biotechnology</p> <p><b>6:</b> learn how to identify different chordate animals practically</p> <p><b>7:</b> understand anatomy of a cartilagenous fish (Shark)</p> <p><b>8:</b> learn histological structure of mammalian lung, bone and cartilage</p>
4	ZO-4501	Animal Biochemistry, Biophysics & Animal Physiology	<p><b>1:</b> get their first exposure to elementary biochemistry by understanding the basics of proteins</p> <p><b>2:</b> understand applications of basic principles of physics to biological processes: osmosis, adsorption <i>etc.</i></p> <p><b>3:</b> understand and differentiate histology of mammalian digestive organs</p> <p><b>4:</b> understand and appreciate mammalian neurophysiology</p> <p><b>5:</b> gain knowledge of types and structure of Human receptors organs</p>
4	ZO-4502	Applied Zoology	<p><b>1:</b> understand the economic importance of insect groups and their control</p> <p><b>2:</b> study fishing Nets and Boats</p> <p><b>3:</b> identify economically important fishes</p> <p><b>4:</b> basic knowledge of Home aquarium</p> <p><b>5:</b> know induced breeding technique in fishes</p> <p><b>6:</b> understand the lifecycles and their pathogenicity of some of the most common parasites. This will prepare them to do some research and design ways for their eradication thereby increasing the students' scope of employability</p>
4	ZO-4503L	Practicals Based on Animal Biochemistry, Biophysics and	<p><b>1:</b> confirm whether any given unknown solution contains proteins in it or not by some fundamental qualitative biochemical tests.</p>

		Animal Physiology & Applied Zoology	<p><b>2:</b> understand applications of basic principles of physics to biological processes: osmosis, adsorption etc. practically.</p> <p><b>3:</b> understand and differentiate histology of mammalian digestive organs practically.</p> <p><b>4:</b> understand mechanism of nerve impulse conduction through neurons and synapse</p> <p><b>5:</b> study receptor organs in Human</p> <p><b>6:</b> identify insect pests of certain crops and stored food materials</p> <p><b>7:</b> identify fishes of commercial value practically</p> <p><b>8:</b> understand structure and operation of fishing Boats and Nets</p> <p><b>9:</b> learn about some important fauna and sites of conservation</p> <p><b>10:</b> whatever the students have learn about parasitology in theory, they will understand the same practically</p>
5	ZO-5501	Animal Diversity(Nonchordates)	<p><b>1:</b> understand the structural organisation of nonchordates</p> <p><b>2:</b> learn the anatomical-adaptive features in nonchordates</p> <p><b>3:</b> know key nonchordates of minor phyla with their general characteristics</p>
5	ZO-5502	Animal Diversity(Chordates)	<p><b>1:</b> understand anatomy of bony fishes (Labeo)</p> <p><b>2:</b> understand anatomy of reptiles (Calotes)</p> <p><b>3:</b> understand anatomy of birds (Pigeon)</p> <p><b>4:</b> know general topics of fishes, amphibia, reptiles, birds and mammals</p> <p><b>5:</b> Compare internal structure of organs systems of vertebrates and its significance in understanding organic evolution</p>
5	ZO-5503	Animal Biochemistry & Metabolism	<p><b>1:</b> enhance their knowledge of the remaining major biomolecules viz., Carbohydrates, Lipids and Enzymes.</p> <p><b>2:</b> understand the significance of the biomolecules and how they interact amongst themselves in a complex</p>

			<p>biological system and will also realize, to some extent, their day-to-day role in our diet &amp; health.</p> <p><b>3:</b> understand the metabolism of the biomolecules and the energetics involved.</p> <p><b>4:</b> have a fundamental idea of Enzymology, without which biochemistry would be incomplete.</p> <p><b>5:</b> develop an ability to present their work through written, oral and visual presentations and will be prepared to pursue higher education in any biochemistry-related field of studies</p>
5	ZO-5504	Cytology, Developmental Biology	<p><b>1:</b> have fundamental knowledge of different kinds of microscopes and their working viz., electron microscopes, phase contrast microscope and confocal microscopes; student will also have fundamental knowledge of biochemical techniques like various kinds chromatography and polyacrelamyde gel electrophoresis.</p> <p><b>2:</b> have profound understanding of cytological structure viz., cilia, flagella, centrioles, chromosomes, plasma membrane etc.; student will have profound knowledge of cell division.</p> <p><b>3:</b> Student will first time study concept of developmental biology (embryology) by studying various processes like gametogenesis, regeneration, embryonic Induction, kinds of eggs etc., Fundamental understanding of this will strengthen their basics for higher studies and research.</p> <p><b>4:</b> understand basics of embryology by studying chick embryology in detail.</p>
5	ZO-5401	Bio Statistics, Human Reproductive heath, Zoology Parks, Nutrition	<p><b>1:</b> learn application of statistical methods for experimental design and validation of practical data</p> <p><b>2:</b> gain proper scientific knowledge about human reproductive health which in turn</p>

			<p>can help in building a better society at large.</p> <p><b>3:</b> be aware about the zoological parks and their management</p> <p><b>4:</b> understand nutritional aspects of vitamins and minerals as well as major biomolecules, this can increase employability as a nutritional expert by gaining further qualification and knowledge of the field.</p>
5	ZO-5505L	Zoology Practicals	<p><b>1:</b> learn anatomy of nonchordates of major phyla</p> <p><b>2:</b> learn the peculiarities of nonchordates</p> <p><b>3:</b> study anatomy of vertebrate types</p> <p><b>4:</b> know about general topics of vertebrates- Respiratory organs in fishes, parental care in fishes and amphibians, skull in reptiles and its significance in classification, extinct reptiles, Dentition in mammals, Aquatic mammals</p> <p><b>5:</b> practically compare internal structure of organs systems of vertebrates and its significance in understanding organic evolution</p> <p><b>6:</b> gain proficiency basic laboratory methodologies in biochemistry.</p> <p><b>7:</b> apply their scientific knowledge to biochemistry experimentations.</p> <p><b>8:</b> demonstrate excellent critical thinking abilities to interpret their experimental data</p> <p><b>9:</b> practically perform paper chromatograph and Karyotyping and will have demonstration of PAGE, this will nurture them with practical skill which will be very helpful in their further study.</p> <p><b>10:</b> prepare slides of mitosis, Barr Body etc., which will boost them with practical aptitude.</p> <p><b>11:</b> explore concepts of developmental biology by models and charts.</p> <p><b>12:</b> observe slides of various hrs. chick development under the microscope which</p>

			enable them to understand hour's wise difference in development.
6	ZO-6501	Ecology, Pollution, Animal Diversity (Mol. Biol. & Genetics)	<ol style="list-style-type: none"> <li><b>1:</b> Learn ecological adaptations in animals with reference to habitats</li> <li><b>2:</b> learn abiotic and biotic factors and characteristics of terrestrial, freshwater and marine ecosystems</li> <li><b>3:</b> understand process of ecological succession</li> <li><b>4:</b> learn sources of environmental pollution</li> <li><b>5:</b> understand impact of environmental pollutants on animals and its control measures</li> <li><b>6:</b> know biological treatment of effluents</li> <li><b>7:</b> learn anatomy of Rat as representative of mammal</li> <li><b>8:</b> basic principles of bird watching</li> <li><b>9:</b> understand anatomical peculiarities of birds (beaks and feet) and mammals (skin – structure and its derivatives)</li> <li><b>10:</b> describe the fundamental molecular principles of genetics.</li> <li><b>11:</b> understand the structure and function of DNA, RNA and protein.</li> <li><b>12:</b> explain the way in which genes code for proteins.</li> <li><b>13:</b> understand the relationship between phenotgene linkagype and genotype.</li> <li><b>14:</b> learn mechanisms of gene linkage and crossing over</li> </ol>
6	ZO-6502	Human Physiology	<ol style="list-style-type: none"> <li><b>1:</b> build a foundation of certain areas of Human Physiology</li> <li><b>2:</b> understand the basics of human Lymphatic System and Immunity and its role in the defence mechanisms of human health.</li> <li><b>3:</b> understand the basics of human Respiration and Cardiology.</li> <li><b>4:</b> explain the fundamentals of the physiology of human Reproduction and the role of various sex hormones during the important phases of our life.</li> </ol>

			<p><b>5:</b> describe the elementary structure of skeletal muscles and the physiology of their contraction.</p>
6	ZO-6503	Toxicology, Animal Biotechnology, Animal Behaviour, Mammalian Histology	<p><b>1:</b> learn types of various toxicants and their impact on biological systems</p> <p><b>2:</b> learn techniques in biotechnology</p> <p><b>3:</b> understand types of behaviour in animals and learn habituation practically</p> <p><b>4:</b> study hormonal functions and structure of the endocrine glands</p>
6	ZO-6504	Applied Zoology	<p><b>1:</b> gain fundamentals of apiculture; as a basics understanding provided with practical further skill in the profession can increase self-employability in field of honey and wax production.</p> <p><b>2:</b> Basic study and exploring sericulture industry can enable students to get employment in the field of sericulture and ever shining silk industry.</p> <p><b>3:</b> Having fundamental knowledge of poultry breeds, poultry house and other concepts of poultry industry can boost a student's own entrepreneurship in the poultry farming.</p> <p><b>4:</b> Having fundamental knowledge of fishery sciences like kinds of fisheries, fish pathology, fish by-products and other concepts of fishery science can boost a student's own aptitude as an entrepreneur in the fishery industry.</p>
6	ZO-6401	Cancer Biology, Cytological Techniques	<p><b>1:</b> get a basic idea of the different types of cancer and the different theories of carcinogenesis.</p> <p><b>2:</b> understand various mechanisms of carcinogenesis by chemicals and viruses</p> <p><b>3:</b> learn how to preserve animals and their body parts permanently</p> <p><b>4:</b> understand principles and methods of animal tissue fixation and staining by various methods</p>
6	ZO-6505L	Zoology Practicals	<p><b>1:</b> identify different animals and learn their ecological adaptations practically</p>

			<p><b>2:</b> understand physico-chemical characteristics of various ecosystems</p> <p><b>3:</b> able to evaluate chemical parameters of water quality</p> <p><b>4:</b> learn anatomical peculiarities of Rat as representative of mammal</p> <p><b>5:</b> understand detailed structure of nucleic acids and related molecular biology techniques</p> <p><b>6:</b> gain expertise in certain basic laboratory methodologies in human haematology.</p> <p><b>7:</b> understand the significance of sterilization during the haematology practicals.</p> <p><b>8:</b> Easily prick their own fingers and collect blood for the various haematology practicals.</p> <p><b>9:</b> practically apply their theoretical knowledge of human haematology and demonstrate how to determine their own Total RBC/WBC counts, Hb concentration, identification of different types of WBC by preparing a blood smear as-well-as Bleeding Time &amp; Clotting Time.</p> <p><b>10:</b> With some allied PG diploma course, all these techniques will help them in their employability in various pathology laboratories and institutes like Red Cross or similar places</p> <p><b>11:</b> learn aspects of histotechnology</p> <p><b>12:</b> identify the cells, tissues of endocrine glands</p> <p><b>13:</b> learn animal behavioural aspects specially learning-habitation</p> <p><b>14:</b> gain fundamentals of apiculture practically; as a basics understanding provided with practical further skill in the profession can increase self-employability in field of honey and wax production.</p> <p><b>15:</b> Basic study and exploring sericulture industry can enable students to get</p>
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