

<p>General characters and classification up to classes (Ruppert and Barnes, 1994, 6th Ed.); Metagenesis in Obelia.</p> <p>Unit 4: Phylum Platyhelminthes General characters and classification up to classes (Ruppert and Barnes, 1994, 6th Ed.); Life history of <i>Taenia solium</i>.</p> <p>Unit 5: Phylum Nematelminthes General characters and classification up to classes (Ruppert and Barnes, 1994, 6th Ed.); Life history of <i>Ascaris lumbricoides</i> and its adaptation</p> <p>Unit 6: Phylum Annelida General characteristics and Classification up to classes (Ruppert and Barnes, 1994). Metamerism in Annelida.</p> <p>Unit 7: Phylum Arthropoda General characters and classification up to classes (Ruppert and Barnes, 1994, 6th Ed.); Eye in Cockroach, Metamorphosis in Lepidoptera.</p> <p>Unit 8: Phylum Mollusca General characteristics and Classification up to classes (Ruppert and Barnes, 1994); respiration in <i>Pila sp.</i></p> <p>Unit 9: Phylum Echinodermata General characteristics and Classification up to classes (Ruppert and Barnes, 1994); Water vascular system in Asterozoa.</p> <p>Unit 10: Protochordates General Characters; Pharynx and feeding mechanism in <i>Amphioxus</i>.</p> <p>Unit 11: Agnatha General features of Agnatha and classification of cyclostomes up to classes (Young, 1981).</p> <p>Unit 12: Pisces General features and Classification up to orders (Young, 1981); Osmoregulation in Fishes.</p> <p>Unit 13: Amphibia General features and Classification up to orders (Young, 1981); Parental care.</p> <p>Unit 14: Reptiles General features and Classification up to orders (Young, 1981); Poisonous and non-poisonous snakes, Biting mechanism.</p> <p>Unit 15: Aves General features and Classification up to orders (Young, 1981); Flight adaptations in birds.</p>	<p>features of each taxon upto class level for non-chordates and upto Order level for Chordates.</p> <p>CO 02. Discussing special features specific to different phyla like locomotion in protost, canal system in Porifera, life history of some platyhelminth and nematelminth parasites, metamerism in annelids, metamorphosis in arthropods, water vascular system in echinoderms..</p> <p>CO 03. Study on classification and salient features of several protochordates and chordate forms and discussing special features like osmoregulation in fishes, parental care in amphibians, biting mechanism in snake, flight adaptation in birds and exo-skeletal derivatives in mammals.</p>
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<p>ZOOG-CC1-1-P</p>	<p>Unit 16: Mammals Classification up to orders (Young, 1981); Hair, Horn & Antler, Nail & claw.</p> <p>Practical</p> <p>Animal Diversity</p> <p>1. Identification with reasons of the following specimens: <i>Amoeba, Euglena, Paramecium, Sycon, Obelia, Aurelia, Metridium, Taeniasolium, Ascarislumbricoides</i> (Male and female), <i>Aphrodite, Nereis, Hirudinaria, Palaemon, Cancer, Limulus, Apis, Chiton, Dentalium, Unio, Sepia, Octopus, Echinus, Cucumaria</i> and <i>Antedon, Balanoglossus, Branchiostoma, Petromyzon, Torpedo, Labeorohita, Exocoetus, Salamandra, Hyla, Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Bat, Funambulus.</i></p> <p>2. Key for Identification of poisonous and non-poisonous snakes.</p> <p>3. Study of anatomy of digestive system, salivary gland, mouth parts of <i>Periplaneta</i>, Study of reproductive system of female cockroach.</p>	<p>The students will develop the skill to</p> <p>CO 04. Augmenting the theoretical knowledge gained in CCG1 by studying selected preserved museum specimen for each phylum.</p> <p>CO 05. Gaining expertise in invertebrate dissection by studying various systems of Cockroach.</p> <p>CO 06. Preparation of Animal album project.</p>
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Core Courses	Content of CU Syllabus	Course Outcome
Semester 2		
<p>CCG02</p> <p>ZOOG-CC2-2-TH</p>	<p>Comparative Anatomy & Developmental Biology</p> <p>Unit 1: Integumentary System Derivatives of integument with respect to glands in Birds & Mammals.</p> <p>Unit 2: Digestive System Stomach and Dentition.</p> <p>Unit 3: Respiratory System Brief account of Gills, lungs, air sacs and swim bladder.</p> <p>Unit 4: Circulatory System Evolution of heart and aortic arches.</p> <p>Unit 5: Urino-genital System Succession of kidney, Evolution of urino-genital ducts.</p> <p>Unit 6: Early Embryonic Development</p>	<p>The students will get a clear picture of</p> <p>CO 01. Exploring anatomical variations in different animal systems by studying their brief accounts.</p> <p>CO 02. Gaining knowledge of early and late embryonic development with relation to sea-urchin, frog, chick and mammals.</p>

<p>ZOOG- CC2-2-P</p>	<p>Gametogenesis: Spermatogenesis and oogenesis with respect to mammals. Fertilization: Sea-Urchin; Early development of frog; structure of mature egg and its membranes, patterns of cleavage, fate map, up to formation of gastrula; types of morphogenetic movements; Fate of germ layers.</p> <p>Unit 7: Late Embryonic Development Placenta types and function; Metamorphic events in frog life cycle and its hormonal regulation.</p> <p>Practical</p> <p>Comparative Anatomy & Developmental Biology Lab</p> <ol style="list-style-type: none"> 1. Osteology: Limb bones, girdle and vertebra of Pigeon & Guinea pig, Mammalian skulls: One herbivorous; Guinea pig and one carnivorous; Dog. 2. Larval stages: Veliger, Nauplius, Trochophore, Mysis. 3. Study of the different types of placenta- histological sections through photomicrographs. 4. Developmental stages of chick embryo: 24 Hrs., 48 Hrs, 72 Hrs., 96 Hrs. 	<p>The students will develop the skill to</p> <p>CO 03. Visually identifying astrological specimen, gaining knowledge about Larval forms of various Invertebrate Phyla, Learning to identify different types of Placenta and chick embryo Histologically.</p>
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Core Courses	Content of CU Syllabus	Course Outcome
Semester 3		
<p>CCG03</p> <p>ZOOG- CC3-3-TH</p>	<p>Physiology and Biochemistry</p> <p>Unit 1: Nerve and muscle Structure of a neuron, resting membrane potential, Origin of Action potential and its propagation in myelinated and non-myelinated nerve fibres, Ultra-structure of skeletal muscle, Molecular and chemical basis of muscle contraction.</p> <p>Unit 2: Digestion Physiology of digestion in the alimentary canal; Absorption of carbohydrates, proteins, lipids.</p> <p>Unit 3: Respiration Pulmonary ventilation, Transport of Oxygen and carbon.</p> <p>Unit 4: Cardio-vascular system</p>	<p>The students will get a clear picture of</p> <p>CO 01. Gaining knowledge about the basic physiological functions like Digestion, Respiration, Circulation, Excretion, Control and</p>

<p>ZOOG- CC3-3-P</p>	<p>Composition of blood, Structure of Heart, Origin and conduction of the cardiac impulse,cardiac cycle.</p> <p>Unit 5: Excretion Structure of nephron, Mechanism of Urine formation; Counter-current Mechanism.</p> <p>Unit 6:Reproduction and Endocrine Glands Physiology of male reproduction: Histology of testis, hormonal control of spermatogenesis;Physiology of female, reproduction: Histology of ovary, hormonal control of menstrual cycle. Structure and function of pituitary, thyroid, pancreas and adrenal.</p> <p>Unit 7: Carbohydrate Metabolism Glycolysis, Kreb’s cycle, Glycogenesis, Electron Transport Chain.</p> <p>Unit 8: Lipid metabolism Beta oxidation of Palmitic acid {saturated (C 16:0)} and Linoleic acid {unsaturated (C 18:2)}.</p> <p>Unit 9: Protein Metabolism Transamination, Deamination, Urea cycle.</p> <p>Unit 10. Enzyme Enzyme Classification, factors affecting enzyme action, Inhibition.</p> <p>Practical Physiology and Biochemistry Lab</p> <ol style="list-style-type: none"> 1. Study of permanent histological sections of mammalian pituitary, thyroid, pancreas, adrenal gland. 2. Study of permanent histological sections of mammalian duodenum, liver, lung, kidney. 3. Qualitative test for carbohydrate samples. 	<p>coordination.</p> <p><i>CO 02.</i> Learning various pathways of Carbohydrates, Lipids and Protein Metabolism. Understanding various concepts of Enzyme actions.</p> <p>The students will develop the skill to</p> <p><i>CO 03.</i> Identification of some permanent Mammalian Histological sections and quantitative analysis of Carbohydrates samples.</p>
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<p>SEC-A ZOOG- SEC-A-3-1- TH</p>	<p>Apiculture</p> <p>Unit 1: Biology of Bees Classification and Biology of Honey Bees Social Organization of Bee Colony.</p> <p>Unit 2: Rearing of Bees Artificial Bee rearing; Apiary, Beehives - Newton and Langstroth, Bee Pasturage; Selection of Bee Species for Apiculture; Bee Keeping Equipment; Methods of Extraction of Honey; Indigenous and Modern.</p> <p>Unit 3: Diseases and Enemies Bee Diseases and Enemies Control and Preventive measures.</p> <p>Unit 4: Bee Economy Products of Apiculture Industry and its Uses; Honey, Bees Wax, Propolis, Pollen etc.</p> <p>Unit 5: Entrepreneurship in Apiculture Bee Keeping Industry - Recent Efforts, Modern Methods in employing artificial Beehives for cross.</p>	<p>The students will develop the skill to obtain and utilize</p> <p><i>CO 01.</i> Concepts of Biology of Honeybees, Classification, Bee Rearing Methods, Products of Bee Culture and their Industrial uses, Diseases and pest of Honeybee and their management.</p> <p><i>CO 02.</i> Recent efforts and modern methods employed in Bee-Keeping Industry.</p>
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Core Courses	Content of CU Syllabus	Course Outcome
Semester 4		
<p>CCG04 ZOOG- CC4-4-TH</p>	<p>Genetics & Evolutionary Biology</p> <p>Unit 1: Mendelian Genetics and its Extension Principles of Inheritance, Chromosome theory of inheritance, Incomplete dominance and codominance, Multiple alleles, lethal alleles, sex linked inheritance in Drosophila (White eye locus) & Human (Thalassemia).</p> <p>Unit 2: Linkage, Crossing Over Linkage and crossing over, Complete & Incomplete Linkage, Recombination frequency as a measure of linkage intensity. Holiday Model.</p> <p>Unit 3: Mutation Chromosomal mutation, Deletion, duplication, inversion, translocation, aneuploidy, gene mutation, induced mutation, types & example.</p> <p>Unit 4: Sex determination</p>	<p>The students will get a clear picture of</p> <p><i>CO 01.</i> Reinforcing basic concepts of classical Mendelian genetics and learning concepts of its extension.</p> <p><i>CO 02.</i> Basic concept of recombination using Holiday model, different types of chromosome and gene mutation, fundamental basis of sex determination.</p>

<p>ZOOG- CC4-4-P</p>	<p>Genic Balance theory and dosage compensation in Drosophila.</p> <p>Unit 5: Origin of Life Chemical Origin of life.</p> <p>Unit 6: Evolutionary Theories Lamarckism, Darwinism, Neo-Darwinism.</p> <p>Unit 7: Process of Evolutionary changes Isolating mechanism, Natural Selection.</p> <p>Unit 8: Speciation Sympatric, Allopatric, Parapatric.</p> <p>Practical</p> <p>Genetics and Evolutionary Biology Lab</p> <ol style="list-style-type: none"> 1. Verification of Mendelian Ratio using Chi square test. 2. Identification of Human Aneuploidy using photo graph of karyotype. 3. Phylogeny of horse with diagram of limb and skull. 4. Study and identification of Darwin Finches from photographs. 5. Visit to natural history museum and submission of report. 	<p><i>CO 03.</i> Describing chemical origin of life on earth.</p> <p><i>CO 04.</i> Understanding various theories of evolution, learning how isolating mechanisms and natural selection favour evolution and origin of new species.</p> <p>The students will develop the skill to</p> <p><i>CO 05.</i> Study of concepts of Human aneuploidy, Phylogeny of horse and evolution of Darwin finches using photographs.</p> <p><i>CO 06.</i> Develop idea about evolutionary basis in fossil and extant animals and importance of conservation of museum specimens.</p>
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<p>SEC-B ZOOG- SEC-B-4-2- TH</p>	<p>Aquarium Fish Keeping</p> <p>Unit 1: Introduction to Aquarium Fish Keeping The potential scope of Aquarium Fish Industry as a Cottage Industry, Exotic and Endemic species of Aquarium Fishes.</p> <p>Unit 2: Biology of Aquarium Fishes Common characters and sexual dimorphism of Fresh water and Marine Aquarium fishes such as Guppy, Molly, Sword tail, Gold fish, Angel fish, Blue morph, Anemone fish and Butterfly fish.</p> <p>Unit 3: Food and feeding of Aquarium fishes Use of live fish feed organisms. Preparation and composition of formulated fish feeds.</p> <p>Unit 4: Fish Transportation Live fish transport - Fish handling, packing and forwarding techniques.</p> <p>Unit 5: Maintenance of Aquarium General Aquarium maintenance - budget for setting up an Aquarium Fish Farm as a Cottage.</p>	<p>The students will develop the skill to</p> <p>CO 01. Study of Aquarium fish keeping as a vocation based course by realizing the scope and future prospects of this industry.</p> <p>CO 02. Understanding of different species of cultivable and ornamental fish.</p> <p>CO 03. Designing and management of Aquarium.</p>
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Core Courses	Content of CU Syllabus	Course Outcome
Semester 5		
<p>DSEA1 ZOOG- DSE-A-5-1- TH</p>	<p>Applied Zoology</p> <p>Unit I: Host & Parasite Relationship Type of Host, Types of Parasites, Other types of Relations.</p> <p>Unit 2: Epidemiology of Diseases Transmission, Prevention and Control of Tuberculosis and Typhoid.</p> <p>Unit 3: Parasitic Protozoa Life History and pathogenicity of <i>Entamoeba histolytica</i>, <i>Plasmodium vivax</i> and <i>Trypanosoma gambiense</i>.</p> <p>Unit 4: Parasitic Helminthes Life History and pathogenicity of <i>Ancylostoma duodenale</i>, <i>Wuchereria bancrofti</i>.</p> <p>Unit 5: Insect of Economic Importance Biology, Control and Damage caused by <i>Helicoverpa armigera</i>,</p>	<p>The students will get a clear picture of</p> <p>CO 01. Concepts of Host- Parasite interaction, Life history of Economically important Protozoan, Helminthes, Arthropod Parasite/Disease causing organisms/ Pests.</p>

<p>ZOOG- DSE-A-5-1- P</p>	<p><i>Pyrillaperpusilla, Sytophilusoryzae and Triboliumcastaneum.</i></p> <p>Unit 6: Insect of Medical Importance Medical Importance and control of <i>Anopheles</i>.</p> <p>Unit 7: Animal Husbandry Preservation and artificial insemination in cattle; Induction of early puberty and synchronization of estrus in cattle.</p> <p>Unit 8: Poultry Farming Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs.</p> <p>Unit 9: Fish Technology Genetic improvements in aquaculture industry; Induced breeding and transportation of fish seed.</p> <p>Practical</p> <p>Applied Zoology</p> <ol style="list-style-type: none"> 1. Study of <i>Plasmodium vivax, Entamoebahistolytica, Trypanosomagambiense, Ancylostoma-duodenale</i> and <i>Wuchereriabancrofti</i> and their life stages through permanent-slides/photomicrographs or specimens. 2. Study of arthropod vectors associated with human diseases: <i>Pediculus, Culex, Anopheles, Aedes</i> 3. Study of insect damage to different plant parts/stored grains through damaged products/photographs. 4. Identifying feature and economic importance of <i>Helicoperva; Heliolithisarmigera, Papiliodemoleus, Pyrillaperpusilla, Callosobruchuschinensis, Sitophilusoryzae and Triboliumcastaneum.</i> 5. Visit to poultry farm or animal breeding centre. Submission of visit report. 6. Maintenance of freshwater aquarium(demonstration only). 	<p>CO 02. Concepts of Animal Husbandry, Poultry farming and Fish technology.</p> <p>The students will develop the skill to obtain knowledge from</p> <p>CO 03. Photographic studies of Disease causing organisms/Vectors/Pests.</p>
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<p>SEC-A1 ZOOG- SEC-A-5-3- TH</p>	<p>Sericulture</p> <p>Unit 1: Introduction Sericulture: Definition, history and present status; Silk route; Types of silkworms, Distribution and Races Exotic and indigenous races Mulberry and non-mulberry Sericulture.</p> <p>Unit 2: Biology of Silkworm Life cycle of Bombyx mori; Structure of silk gland and secretion of silk.</p> <p>Unit 3: Rearing of Silkworms Selection of mulberry variety and establishment of mulberry garden Rearing house and rearing appliances Disinfectants: Formalin, bleaching powder, RKO Silkworm rearing technology: Early age and Late age rearing Types of mountages; Spinning and harvesting and storage of cocoons.</p> <p>Unit 4: Pests and Diseases Pests of silkworm: Uzi fly, dermestid beetles and vertebrates Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial Control and prevention of pests and diseases.</p> <p>Unit 5: Entrepreneurship in Sericulture Prospectus of Sericulture in India: Sericulture industry in different states, employment, potential in mulberry and non-mulberry sericulture. Visit to various sericulture centres.</p>	<p>The students will develop the skill to</p> <p><i>CO 01.</i> History, development and organization of sericulture industry.</p> <p><i>CO 02.</i> Understanding biology of silkworm, rearing.</p> <p><i>CO 03.</i> Gaining knowledge of Techniques of Mulberry garden establishment, cultivation, pruning and management.</p> <p><i>CO 04.</i> Harvesting and storage of silk, silkworm pests and diseases.</p> <p><i>CO 05.</i> Future and prospects of silk industry in India.</p> <p><i>CO 06.</i> Visiting sericulture centres to gain an insight of the concepts learned in theory and familiarity with various sericulture practices.</p>
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Core	Content of CU Syllabus	Course Outcome
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<p>DSEB2</p> <p>ZOOG- DSE-B-6-2- TH</p>	<p>Ecology & Wild life Biology</p> <p>Unit 1: Introduction to Ecology Ecosystem, Autecology and synecology, Levels of organization, Laws of limiting factors, Study of Physical factors, The Biosphere.</p> <p>Unit 2: Population Attributes of population: Life tables, fecundity tables, survivorship curves, dispersal and dispersion. Geometric, exponential and logistic growth, equation and patterns, Population regulation: density-dependent and independent factors.</p> <p>Unit 3: Community Community characteristics: species diversity, abundance, dominance, richness, Vertical stratification, Ecotone and edge effect.</p> <p>Unit 4: Ecosystem Types of ecosystem with an example in detail, Food chain: Detritus and grazing food chains, Linear and Y-shaped food chains, Food web, Energy flow through the ecosystem, Ecological pyramids and Ecological efficiencies.</p> <p>Unit 5: Wild Life Wildlife Conservation (in-situ and ex-situ conservation): Necessity for wildlife conservation; National parks & sanctuaries, Tiger conservation - Tiger reserves in India; Management challenges in Tiger reserve.</p>	<p>The students will get a clear picture of</p> <p>CO 01. Understanding concepts of Ecosystem, Autoecology, Synecology, Attributes of Population, different growth curves, r- and k- selection, population regulation Community characteristics.</p> <p>CO 02. Understanding concepts of energy flow in ecosystem, food chain, pyramids, Wildlife management and conservation challenges.</p>
<p>ZOOG- DSE-B-6-2- P</p>	<p>Practical Ecology & Wild life Biology</p> <p>1 Identification of flora, mammalian fauna, avian fauna.</p> <p>2. Demonstration of basic equipment needed in wildlife studies use, care and maintenance (Compass, Binoculars, Spotting scope, Range Finders, Global Positioning System, Various types of Cameras and lenses).</p> <p>3. Familiarization and study of animal evidences in the field; Identification of animals through pug marks, hoof marks, scats, pellet groups, nest, antlers, etc.</p> <p>4. Study of an aquatic ecosystem: Phytoplankton and zooplankton, Measurement of area, temperature, salinity, determination of pH, and Dissolved Oxygen content (Winkler's method), Chemical</p>	<p>The students will develop the skill to obtain knowledge from</p> <p>CO 03. Practical aspects of wildlife biology on field approach towards their identification and conservation implications.</p> <p>CO 04. Documentation of wildlife with use of modern tools like Range finder, GPS, camera trap, etc.</p> <p>CO 05. Different density measurement protocols in field like mark and recapture, area, DO₂ and COD measurement.</p>

<p>SEC-B1 ZOOG- SEC-B-6-4- TH</p>	<p>Medical diagnosis</p> <p>Unit 1: Diagnostics Methods Used for Analysis of Blood Blood composition, Preparation of blood smear and Differential Leucocyte Count (D.L.C) using Leishman's stain, Platelet count using haemocytometer, Erythrocyte Sedimentation Rate (E.S.R)</p> <p>Unit 2: Diagnostic Methods Used for Urine Analysis Urine Analysis: Physical characteristics; Abnormal constituents, Urine culture.</p> <p>Unit 3: Non-infectious Diseases Causes, types, symptoms, complications, diagnosis and prevention of Diabetes (Type I and Type II), Hypertension (Primary and secondary), Testing of blood glucose using Glucometer/Kit</p> <p>Unit 4: Infectious Diseases Causes, types, symptoms, diagnosis and prevention of Tuberculosis and Hepatitis, Malarial parasite (Microscope based and ELISA based).</p> <p>Unit 5: Clinical Biochemistry Lipid profiling, Liver function test. PSA test.</p> <p>Unit 6: Clinical Microbiology Antibiotic Sensitivity Test.</p> <p>Unit 7: Tumours Types (Benign/Malignant), Detection and metastasis; Medical imaging: X-Ray of Bone fracture.</p> <p>Unit 8: Visit to Pathological Laboratory and Submission of Project</p>	<p>The students will develop the skill to</p> <p><i>CO 01.</i> Gaining knowledge of Diagnostic methods used for analysis of Blood and Urine like DLC ESR, Platelet count, Urine Culture etc.</p> <p><i>CO 02.</i> Study of Causes, Types, Symptoms, Diagnosis and Prevention of Infectious and Non – infectious Diseases.</p> <p><i>CO 03.</i> Understanding concepts of Clinical Biochemistry, Clinical Microbiology and Tumour Detection.</p> <p><i>CO 04.</i> Understanding hands on scenario of pathological labs and modern tools and techniques used for medical diagnosis.</p>
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