

COURSE MODULE  
ZOOLOGY HONOURS  
NEW SYLLABUS  
(Burdwan University)  
W.E.F. A. Y.  
2014 - 2015

**Part I (Paper – I)**

Group		Sub group	Topic	Sub topic	No. of Class	Extra class (if any)		
A: Systematics	1	Systematics and taxonomy		Definitions: Classification, systematics and taxonomy, hierarchy	2			
				Taxonomic types	1			
	2	Zoological Nomenclature		General idea of codes of Zoological Nomenclature	2			
				Principle of priority, synonym and homonym	1			
				4	New Taxonomy	Basic idea	Cytological taxonomy	2
			Biochemical taxonomy	2				
B: Non-chordate Diversity and Relationships	1	Classificatory schemes of the living world	Kingdom concept	Six Kingdom concept	1			
				Classification (outline scheme)	Sub-Kingdom Protozoa (up to Phyla) (Levine et al. 1980)	1		
	2	Classification with Characters, Examples (Scientific Names)	outline scheme	Upto Classes: Ruppert and Barnes (6th Ed. 1994)	Minor Phyla	1		
					Phylum Nematoda	1		
					Phylum Arthropoda	2		
					Upto Sub-Classes: Ruppert and Barnes (6th Ed. 1994)	Phylum Cnidaria	1	
					Phylum Platyhelminthes	1		
					Phylum Mollusca	1		
	Phylum Echinodermata	1						
	Up to Orders: Hyman (1940)	Phylum Porifera	1					
Up to Orders: Ruppert and Barnes (6th Ed. 1994)	Phylum Annelida	1						
3	Metazoa		Origin of Metazoa and coelom	2				
			Metamerism and symmetry	1				
C: Type Study	1	<i>Paramecium</i>		Locomotion	1			
				Osmoregulation	1			
				Reproduction	2			
	2	<i>Sycon</i>		Cell types	1			
				Spicules	1			
	3	Earthworm		General Morphology	2			
				Reproductive System	2			
	4	<i>Periplaneta</i>		General Morphology	2			
				Excretory system	1			
				Reproductive system	2			
	5	<i>Pila</i>		Torsion	2			
				Feeding	1			
				Respiratory System	2			
	6	<i>Asterias</i>		General Morphology	2			
Water Vascular System				2				
D: Special features	1	Canal systems		Porifera	2			
	2	Polymorphism		In Siphonophora	1			
				In Social Insects (Honey bee)	1			
	3	Coral reef		Formation	2			
				Types & Distribution	2			
4	Metamorphosis		In Insecta	2				

**Part I (Paper – II)**

Group	Sub group	Topic	Sub topic	No. of Class		
A: Chordate Diversity and Relationships	1	Classification with Characters, Examples (Scientific Names)	Up to Classes: as per J. Z. Young (1981)	Sub-Phylum Urochordata	2	
			Up to Order: as per J. Z. Young (1981)	Sub-Phylum Cephalochordata	1	
			Up to Sub-classes: Romer (1959)	Superclass Agnatha	1	
				Chondrichthyes	1	
			Osteichthyes	1		
			Up to Sub-classes: J. Z. Young (1981)	Aves	1	
	Up to living Orders: Duellman and Trueb (1986)	Amphibia	1			
	Up to living Orders: J. Z. Young (1981)	Reptilia	2			
Mammalia		2				
2	Anatomical peculiarities, distribution and evolutionary significance		Dipnoi	2		
3	Anatomical peculiarities, distribution and imp.		Sphenodon	2		
B: Type Study	1	<i>Branchiostoma</i>		Chordate features	2	
				Feeding	1	
				Circulatory system	1	
	2	<i>Labeo</i>		General Morphology	1	
				Circulatory system	2	
				Respiratory System	1	
	3	Toad		General Morphology	1	
				Skeletal system	2	
				Circulatory System	2	
				Urinogenetal system	2	
	4	<i>Calotes</i>		General Morphology	1	
				Circulatory system	2	
				Excretory System	1	
	5	<i>Columba</i>		Exoskeleton	2	
				Endoskeleton	2	
				Flight muscles	1	
				Respiratory systems	2	
	6	<i>Cavia</i>		Endoskeleton	2	
			Brain	1		
			Cranial nerves	1		
C: Specialized Features of Chordate Animals	1	Snakes	Biting	Apparatus and mechanism	2	
			Venom	Composition and Types	1	
	2	Metamorphosis, neoteny and paedogenesis		Retrogressive (in Ascidia)	1	
				Progressive (in toad/frog)	2	
				Neoteny and pedogenesis	1	
	3	Aerodynamics	Bird	Types and principle	2	
	4	Echolocation	Mammals	Microchiroptera	1	
				Cetaceans	2	
	5	Epidermal derivatives	Mammal	Glands	1	
Hair				1		
Horn				1		

**Part-I Practical Paper  
Paper – III: Non-Chordata**

Day-1	General idea about the Non-chordates anatomy for their Dissections
Day-2	General idea about the Non-chordate specimen Preparations and Staining-Mounting
Day-3	Earthworm: Reproductive System
Day-4	Earthworm: Nervous System
Day-5	Earthworm: Setae
Day-6	Cockroach: Salivary apparatus
Day-7	Cockroach: Nervous System
Day-8	Cockroach: Male Reproductive System
Day-9	Cockroach: Female Reproductive System
Day-10	Cockroach: Mouthparts
Day-11	Cockroach: Mouthparts
Day-12	Way of Non-chordate specimen identifications with reasons
Day-13	<b>Sub-Kingdom Protozoa:</b> Euglena, Paramecium,
Day-14	Phylum Porifera: Euspongia, Scypha Phylum Cnidaria: Obelia, Aurelia, Physalia, Porpita, Sea-Anemone
Day-15	Phylum Platyhelminthes: Fasciola Phylum Nematoda : Ascaris Phylum Annelida: Chaetopterus, Aphrodite, Sabella
Day-16	Phylum Arthropoda: Eupagurus, Apus, Balanus, Hippa, Squilla,
Day-17	Phylum Arthropoda: Oniscus, Belostoma, Buthus, Mantis
Day-18	Phylum Mollusca: Chiton, Patella, Doris, Pinctada, Mytilus, Sepia, Loligo, Octopus
Day-19	And Phylum Echinodermata: Ophiura, Astropecten, Antedon Phylum Hemichordata: Balanoglossus

**Part-I Practical Paper  
Paper – IV: Chordata**

Day-1	General idea about the Chordates anatomy for their Dissections
Day-2	General idea about the Chordate specimen Preparations and Staining-Mounting
Day-3	Indian Major Carp: Brain
Day-4	Indian Major Carp: IXth and Xth Cranial Nerves – origin and distributions
Day-5	Mounting of Weberian ossicles of Carp
Day-6	Staining-Mounting of cycloid and ctenoid scales
Day-7	Fowl: Brain
Day-8	Fowl: Hyoid apparatus
Day-9	Fowl: Vth Cranial Nerves – origin and distributions
Day-10	Fowl: Pecten
Day-11	Brief idea on Chordate specimen identifications with reasons
Day-12	Sub-Phylum Urochordata: Ascidia, Doliolum, Sub-Phylum Cephalochordata: Branchiostoma, Superclass Agnatha: Petromyzon, Myxine, Ammocete larva
Day-13	Chondrichthyes: Torpedo, Hippocampus Osteichthyes: Heteropneustes, Clarias, Exocoetus, Syngnathus
Day-14	Class Amphibia: Tadpole, Rana, Ambystoma, Rhacophorus, Necturus, Pleurodeles (=Tylotriton)
Day-15	Class Reptilia: Draco, Typhlops, Chamaeleo, Naja, Ptyas, Daboia (=Vipera), Hydrophis,
Day-16	Class Aves: Psittacula, Passer, Pycnonotus, Alcedo,
Day-17	Class Mammalia: Pteropus, Funambulus, Suncus
Day-18	Basic idea about the skeletal structure of vertebrates
Day-19	Skull: Toad, Varanus, Columba, Cavia, Old world monkey
Day-20	Appendicular bones: Columba, Cavia
Day-21	Girdle bones: Columba, Cavia
Day-22	Vertebrae: Columba
Day-23	Vertebrae: Cavia

**Part II (Paper – V)**

Group		Sub group	Topic	Sub topic	No. of Class	
C: Zoogeography and Adaptation	1	Geological Time Scale		Schematic Geological Time Scale	2	
	2	Zoogeographical Realms		Zoogeographical Realms with examples; barriers, dispersals and their impact on animal Distribution	4	
	3	Adaptive features	Aquatic vertebrates	Morphological and physiological features of fish and whale	3	
	4	Adaptive features	Desert animals	Reptiles and mammals	3	
	5	Adaptive significance	Animal world	Coloration and Mimicry	3	
D: Evolutionary Biology	1	Origin of Life		Chemical basis and experiments	1	
	2	Theory of Evolution		Darwinism	1	
				Outline idea of Modern Synthetic Theory of Evolution	1	
	3	speciation		Isolating mechanisms and Modes of speciation	2	
	4	Species concept		Biological & Evolutionary	2	
	5	Population ecology		Hardy-Weinberg equilibrium and factors affecting it	3	
	6	Population ecology		Genetic Drift	2	

**Part II (Paper – VI)**

Group		Sub group	Topic	Sub topic	No. of Class	
A: Cell Biology	1a	Plasma membrane		Ultra structure & Functions (outline only)	4	
	1b	Mitochondria		Ultra structure & Functions (outline only)	4	
	1c	Golgi complex		Ultra structure & Functions (outline only)	4	
	1d	Endoplasmic reticulum		Ultra structure & Functions (outline only)	4	
	1e	Ribosome		Ultra structure & Functions (outline only)	2	
	2	Nucleic Acids	DNA	Chemical Structure	1	
				Physical Structure	2	
			RNA	Chemical Structure	1	
				Physical Structure	2	
	3	Chromatin / Chromosome		Nucleosome concept	2	
	4a	Cell cycle		Description, control mechanism & significance	2	
	4b	Mitosis	Types, phases (prophase, prometaphase, metaphase, anaphase, telophase and cytokinesis) & significance		3	
	4c	Meiosis	Types, phases (prophase I, prometaphase, metaphase I, anaphase I, telophase I and interkinesis + prophase II, prometaphase, metaphase II, anaphase II, telophase II cytokinesis) & significance		3	
	5a	Spindle apparatus	Structure, components( tubulins, +end and – end directed motor proteins), mechanism & significance		4	
5b	Synaptonemal complex	Structure, components( proteins and soluble factors), mechanism & significance		2		
B: Genetics	1	Mendelian principles	Mendel's experiments, observations and deductions (principles)		4	
			Extensions of Mendelian inheritance (principles)		4	
	2	Allele	Definition, origin, types (Wildtype, mutant, dominant & recessive allele) allelic interaction		4	
			Multiple alleles and ABO blood group (I gene variant, H gene variants, inheritance patterns)		4	
	3	Linkage & Crossing over	Definition, types (autosomal & Sex-linked, Complete & incomplete) with example		4	
			Crossing over (Holiday model only)		2	
	4	Chromosome map	In diploids with problems		8	
	5	Simple Mendelian inheritance	Definition, Types, Characters (mode, variants / traits)		1	
			Autosomal inheritance (Dominant & recessive) in Man		1	
	6	Sex linked inheritance	X linked inheritance (Dominant & recessive) in Drosophila and Man		2	
			Y linked inheritance in man and Drosophila		1	
	7	Sex determination	Man	Definition, mechanisms (chromosomal & molecular components)		2
Drosophila			Definition, mechanisms & Genic balance & Alternative splicing theories		2	

**Part II (Paper – VII)**

Group		Sub group	Topic	Sub topic	No. of Class	
A: Biochemistry, Biological tools & techniques	1	Biophysical interactions		Definitions with examples from biological systems of optical isomerism	2	
				Hydrophobic and hydrophilic interactions, hydrogen bond, S-S bond, van der Waal's force		
				pH and buffer		
	2	Biophysical processes		Concepts of osmosis, diffusion, Donnan membrane equilibrium	2	
	3	Biological macromolecules		Carbohydrates, proteins and lipids	6	
	4	Enzymes		Classes; kinetics and factors affecting enzyme action	4	
5	Microscopy		Light (bright-field, dark-field and phase contrast) Microscopy	2		
			Electron (SEM and TEM) Microscopy			
B: Metabolism and physiological processes	1	Carbohydrate	Glycolysis	Definition, process, ATP generation	2	
			Pentose Phosphate pathway	Definition, process, ATP generation	2	
			Gluconeogenesis	Definition, process	2	
	2	Amino acids	Transamination	Definition, process	2	
			Oxidative deamination	Definition, process	2	
			Non-Oxidative deamination	Definition, process	2	
	3	Fatty acids	Beta oxidation	Definition, process, ATP generation	4	
	4	Integration	Kreb's cycle	Definition, process, ATP generation	4	
			Electron Transport chain	Definition, process, ATP generation	4	
	5	Respiratory gas transport	Oxygen transport	Role of Hemoglobin, Haldane effect, Bore effect, Role of bisphosphoglycerate, Dissociation curve	4	
			Carbon dioxide transport	Role of Hemoglobin, Chloride shift, Hamburger shift	4	
	6a	Nerve impulse propagation		Definition, Characteristics, mechanism, synapse	4	
	6b	Muscle contraction		Skeletal muscle contraction mechanism	4	



**Part-III Practical Paper  
Paper – VIII**

Day-1	Mitotic stages from onion root tips
Day-2	Meiotic stages of grasshopper
Day-3	Pedigree analysis
Day-4	Identification of ectoparasites
Day-5	Identification of pests
Day-6	Identification of fish
Day-7	Excursion/Lab visit
Day-8	Quantitative estimation of total carbohydrates
Day-9	Quantitative estimation of total proteins
Day-10	Action of salivary amylase
Day-11	Differential Count of blood of man

Part III (Paper – IX) Unit I						
Group		Sub group	Topic	Sub topic	No. of Class	
A: Ethology and Biodiversity Conservation	1	Behaviour		Innate and learned behaviour	2	
				Fixed Action Pattern	2	
	2	Elements of Sociobiology		Selfishness, cooperation, altruism and kinship	4	
					3	
	4	Biodiversity		Definition, levels, values, causes of depletion <i>In-situ</i> and <i>ex-situ</i> conservation, biodiversity Hotspots and megadiversity countries Biodiversity Act; Biodiversity act, Biopiracy	4	
	5	Wildlife of India		Endangered and Critically Endangered Vertebrate Wildlife of India; Wildlife Protection Laws Management strategies with special reference to Tiger & Rhinoceros in India	4	
B: Ecology	1	Concept of Ecosystems		Components, basic properties and principles; concept of limiting factor – impact of temperature on biota	4	
	2	Energy flow		Energy flow through trophic levels and ecological efficiencies	3	
	3	Population dynamics		Natality and mortality, growth forms, regulation of population density	3	
	4	Community structure		Characteristics, types, niche concept, resource partitioning	4	
	5	Ecological succession		Concept of community change, theories of climax, models of succession	3	
	6	Salient features of ecosystems		Characteristics and importance of Indian Rain Forest and Wetland ecosystems	3	
C: Biometry	1	Biostatistics		Definition and importance of Biometry in Zoology	2	
	2	Methods of sampling		Definition, probability and non-probability sampling	2	
	3	Measures of Central Tendency		Measures of Central Tendency – general idea and simple problem solving	2	
	4	Probability		General idea of probability	2	
	5	Test of significance		Student's 't' test	2	
	6	Goodness of fit		Chi-square test	2	

**Part III (Paper – IX) Unit II**

Group		Sub group	Topic	Sub topic	No. of Class	
A: Applied Zoology	1	Pisciculture		Methods and management of Pisciculture	3	
				Induced breeding		
				Composite culture of carp		
				Freshwater prawn culture ( <i>Macrobrachium rosenbergii</i> )		
	2	Sericulture		Rearing and cocoon production in <i>Bombyx mori</i>	1	
				Diseases and pests and their control in <i>Bombyx mori</i>	1	
	3	Poultry		Major fowl breeds	2	
				Deep Litter System of rearing		
				Common diseases and their control measures		
	4	Animal husbandry		Types and distribution of cattle breeds (cow only) in India	1	
				Merits and demerits of artificial cattle breeding	1	
	5	Pest Biology		Pests and their control – cultural, mechanical, chemical, biological control	1	
				Integrated Pest Management	1	
				Bionomics, damage and control measures of Nilaparvata, Apion, Sitophilus	2	
	A: Microbiology, Parasitology and Medical Entomology	1	Microbes		Types of Microbes	1
Normal flora in man and their protective role						
2		Basic structure		Bacteria	2	
3		Animal associations		Phoresis, Commensalisms, Parasitism and Mutualism	1	
4		Parasites and Hosts		Types and examples of Parasites and Hosts	1	
				Host-parasite interactions: morphological and physiological changes	1	
5		Morphology, life-cycle, pathogenicity and control of parasite		<i>Giardia intestinalis</i> ,	1	
				<i>Leishmania sp</i>	1	
				<i>Ascaris lumbricoides</i>	1	
				<i>Wuchereria bancrofti</i>	1	
6		Biology of vectors and their control measures		<i>Anopheles sp.</i>	2	
				<i>Culex sp.</i>		
	<i>Phlebotomus sp.</i>					

**Part III (Paper – X) Unit I**

Group		Sub group	Topic	Sub topic	No. of Class	
A: Molecular biology and Biotechnology	1	DNA replication	Prokaryote ( <i>E. coli.</i> )	Definition: Types, mode (Semi conservative) with experimental evidence	1	
				Enzymes, Role of Mg <sup>++</sup> , factors, Mechanism (Pre-initiation, Initiation, Elongation, Termination, Proof reading)	4	
	2	Chromosomal aberration		Definition, Types(Structural & Numerical), clastogen, origin	2	
			Syndromes	Origin, Variant, Features, frequency, Gene/s responsible for Cri du chat, Down, Turner & Klinefelter	2	
	3	Transcription	<i>Escherichia coli</i>	Definition, Factors, Role of Mg <sup>++</sup> , Mechanism (Initiation, Elongation with models, Rho dependent & Rho independent Termination)	3	
	4		Eukaryotes	mRNA processing (5' Capping, 3' Poly (A) tail addition, splicing, editing)	2	
	5	Genetic code		Definition, Characteristics, Start, sense & Stop codons, deviations	1	
	6	Translation	<i>Escherichia coli</i>	Enzymes, factors, Mechanism (Initiation, Elongation, Termination), Post translational modifications	2	
	7	Gene regulation (Prokaryotes)	Operon	Definition, Types Components	1	
				Inducible operon (Lac operon)	1	
				Repressible operon (Trp operon), Attenuation	1	
	8	Cancer genetics	Cellular level	Types, Tumor, properties of transformed cell	1	
	9	Genetic disorders and diseases in man	PKU	Definition, origin, variants, gene responsible, frequency	1	
			Albinism	Definition, origin, variants, gene responsible, frequency	1	
			Scickle cell anaemia	Definition, origin, variants, gene responsible, frequency	1	
Thalassemia			Definition, origin, variants, gene responsible, frequency	1		
10	Genetic Engineering	Recombinant DNA technology	Definition, restriction endonucleases, vectors, mechanism and use	5		
		DNA fingerprinting	Definition, Mechanism, and applications	3		
B: Immunology	1	Immunity		Innate and adaptive immunity	1	
	2	Immunoglobulin		Classification of immunoglobulin	2	
	3	Acquired immune system	Cells involved (outline idea)	T and B Cell	1	
	4	Basic structure		Antigen, haptan	3	
			Antibody (Ig G IgM IgD, IgA, IgE)			

Part III (Paper – X) Unit II							
Group		Sub group	Topic	Sub topic	No. of Class		
A: Developmental Biology	1	Gametogenesis	Germ cell migration	Definition, types (in insect, fish, amphibian, reptilian ,avian and mammalian)	2		
			Spermatogenesis	Definition, mechanism	2		
			Oogenesis	Definition, types, mechanism	2		
	2	Ultra structure of gametes	Sperm	Structure (physical & chemical)	2		
			Egg	Structure (Physical & chemical)	2		
			Fertilization	Physical & biochemical events	2		
	3	Egg & Cleavage	Egg	Types	2		
			Cleavage	Definition, rules, Role of yolk	2		
	4	Morphogenetic movement		Definition, types	2		
			Gastrulation	Frog	Mechanism	2	
				Chick	Mechanism	2	
	5	Organizer, Induction, competence		Definition, types, Speaman-Mangold experiment	3		
	7	Extra embryonic membranes		In Chick	3		
			Placenta	Definition, Types in mammals, formation and Function			
8	Organogenesis	Eye	Definition , mechanism	3			
		Brain	Definition , mechanism	3			
9	Regeneration		Definition and mechanism	3			
B: Endocrinology	1	Endocrine systems and Hormone action	Hormones	Invertebrate system	4		
				Vertebrate system	4		
	2	Hormones and functions	Endocrine glands	Pituitary, Thyroid, Adrenal, Pancreas	8		
	3	Endocrine disorders in man		Gigantism, Acromegaly, Cretinism, Myxoedema, Goiter, Cushing's and Addison's disease	14		

<b>Part-III Practical Paper</b> <b>Paper – XI: Ecology, Microbiology and Parasitology</b>	
Day-1	General idea on micrometer and Camera Lucida
Day-2	Use of micrometers in measuring of zooplankton
Day-3	Use of Camera Lucida (prism-type) in drawing of zooplankton
Day-4	Use of micrometers in measuring of zooplankton
Day-5	Use of Camera Lucida (prism-type) in drawing of zooplankton
Day-6	Basic idea on Zooplanktons and their types
Day-7	Identification of major zooplanktonic groups (rotifera, cladocera, copepoda and ostracoda) with reasons
Day-8	Brief idea on different physicochemical parameter of water and soil
Day-9	Quantitative estimation of dissolved O <sub>2</sub> (Winkler's method) of natural water by titrimetric method
Day-10	Quantitative estimation of free CO <sub>2</sub> (APHA method) of natural water by titrimetric method
Day-11	Determination of soil pH using pH meter
Day-12	Identification of fish
Day-13	Identification of pests
Day-14	Excursion/Lab visit

<b>Part-III Practical Paper</b> <b>Paper – XII</b>	
Day-1	Tissue fixation
Day-2	Embedding
Day-3	Microtomy
Day-4	Staining and Mounting
Day-5	Demonstration of position of endocrine glands in white rat
Day-6	Identification of mammalian histological tissue sections
Day-7	Chi-square test
Day-8	Student t-test
Day-9	Staining of bacteria from curd sample by Gram staining method
Day-10	Smear preparations and staining of the gut-contents of cockroach for protozoan parasites
Day-11	Smear preparations and staining of the seminal vesicle of earthworm for protozoan parasites
Day-12	Identification of <i>Entamoeba sp.</i> , <i>Giardia sp.</i>
Day-13	Identification of <i>Taenia solium</i> , <i>Ascaris lumbricoides</i> , <i>Ancylostoma duodenale</i> (adult male and female)
Day-14	Identification of <i>Fasciola sp.</i>
Day-15	Identification of vectors: Anopheles, Culex and Phlebotomus
Day-16	Field based study

