

NATIONAL CURRICULUM AND CREDIT FRAMEWORK (NCCF)

Syllabus

INTEGRATED B.SC. HONOURS - M.SC. IN ANIMAL SCIENCE /M.SC. IN ANIMAL SCIENCE (w.e.f. Academic Session 2023-24)



Kazi Nazrul University
Asansol, Paschim Bardhaman
West Bengal 713340

Detailed Syllabus

Semester - 1

Course Name: Diversity of Non-chordates

Course Code: IBSMSASMJ101

Course Type: Major (Theoretical & Practical)	Course Details: MJC-1	L-T-P: 3 - 0 - 4			
Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	15	20	35

Course Learning Outcomes:

After the completion of the course, the students will have the ability to:

- Develop an understanding of the diversity of invertebrate life.
- Group animals on the basis of their morphological characteristics/ structures.
- Develop a critical understanding of how animals changed from primitive cells to a collection of simple cells to form a complex body plan.
- Understand the relative position of individual organs and associated structures through the dissection of the invertebrate representatives.
- Realize that very similar physiological mechanisms are used in very diverse organisms.

Course Content:

Theory (3 credits)		
Unit	Course content	Hours
I	Animal classification: 1. Concept of Classification, Systematics, Taxonomy, Taxonomic hierarchy, Taxonomic types. 2. Codes of Zoological nomenclature. 3. Five and Six Kingdoms and Domain concept of classification. 4. Concept of Minor phyla.	6
II	Protista: 1. General characteristics and classification up to Phylum (Levine et. al., 1980). 2. Basic idea of nutrition and reproduction in Protozoa. 3. Type study: <i>Paramecium</i> .	7
III	Porifera: 1. General characteristics and classification up to Classes (Ruppert & Barnes, 1994). 2. Canal system and Spicules in Porifera. 3. Cellular organization of <i>Sycon</i> .	4
IV	Cnidaria and Ctenophora: 1. General characteristics and classification up to Classes (Ruppert & Barnes, 1994). 2. Polymorphism in Cnidaria. 3. Coral and coral reefs - diversity, formation, importance, and conservation.	4
V	Platyhelminthes and Nematoda: 1. General characteristics and classification up to Classes (Ruppert & Barnes, 1994).	2

VI	Annelida: 1. General characteristics and classification up to Classes (Ruppert & Barnes, 1994). 2. Metamerism in Annelida. 3. Type study: <i>Pheretima</i> .	7
VII	Arthropoda and Onychophora: 1. General characteristics and classification up to Classes (Ruppert & Barnes, 1994). 2. General characteristics and Evolutionary significance of Onychophora. 3. Type study: <i>Macrobrachium</i> .	7
VIII	Mollusca: 1. General characteristics and classification up to Classes (Ruppert & Barnes, 1994). 2. Torsion and distortion in Gastropoda. 3. Type study: <i>Pila</i> .	7
IX	Echinodermata: 1. General characteristics and classification up to Classes (Ruppert & Barnes, 1994). 2. Larval forms in Echinodermata, their evolutionary significance. 3. Water vascular system in Echinodermata.	4
		48
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1) Ganguly B.B., Sinha K.S. & Adhikari S. (2012). Biology of Animals. Vol. I. New Central Book Agency. 2) Barnes R.D. & Ruppert E.E. (1994). Invertebrate Zoology. 6th Ed. Brooks Cole. 3) Brusca R.C. & Brusca G. (2002). Invertebrates. 4th Ed. Sinauer Associates. 4) Chatterjee A. & Chakraborty C. (2015). Text Book of Zoology. Nirmala Library 5) Jordan E.L. & Verma P.S. (2006). Invertebrate Zoology. S. Chand & Company Ltd. 6) Kotpal R.L. (2019). Modern Text Book of Zoology: Invertebrates. 11th Ed. Rastogi Publications. 7) Mayr E. & Ashlock P.D. (1991). Principles of Systematic Zoology. 2nd Ed., McGraw-Hill. 8) Parker T.J. & Haswell W. (1972). Text Book of Zoology, Volume I: Marshall and Williams (Eds.) 7th Ed. Macmillan. 		

Practical (2 credits)

<ol style="list-style-type: none"> 1. Identification (Systematic Position and specimen characters): <i>Amoeba</i>, <i>Euglena</i>, <i>Paramecium</i>, <i>Sycon</i>, <i>Obelia</i>, <i>Physalia</i>, <i>Aurelia</i>, <i>Gorgonia</i>, <i>Pennatulula</i>, <i>Fungia</i>, <i>Adamsia</i>, <i>Fasciola</i>, <i>Ascaris</i>, <i>Aphrodite</i>, <i>Nereis</i>, <i>Pheretima</i>, <i>Hirudo</i>, <i>Limulus</i>, <i>Palamnaeus</i>, <i>Balanus</i>, <i>Palaemon</i>, <i>Hippa</i>, <i>Cancer</i>, <i>Scolopendra</i>, <i>Periplaneta</i>, <i>Patella</i>, <i>Chiton</i>, <i>Pila</i>, <i>Doris</i>, <i>Achatina</i>, <i>Lamellidens</i>, <i>Dentalium</i>, <i>Nautilus</i>, <i>Sepia</i>, <i>Octopus</i>, <i>Antedon</i>, <i>Astropecten</i>, <i>Asterias</i>, <i>Ophiura</i> 2. Dissection of the Digestive System and Reproductive System of Cockroach. 3. Dissection of the Reproductive and Nervous System of Earthworm. 4. Mounting: Mouthparts of Cockroach. 5. Educational excursion to any biodiversity rich place and submission of a field report. 	64 Hours
<p>Suggested Readings:</p> <ol style="list-style-type: none"> 1) Ghosh K.C. & Manna B. (2015). Practical Zoology, New Central Book Agency, Kolkata. 2) Lal S.S. (2016). Practical Zoology - Invertebrate. Rastogi Publication. 3) Sinha J.K., Chatterjee A.K. & Chattopadhyay P. (2015). Advanced Practical Zoology. Books and Allied (P) Ltd. 	

Course Name: Diversity of Non-chordates

Course Code: IBSMSASMN101

Course Type: Minor (Theoretical & Practical)	Course Details: MNC-1		L-T-P: 3 - 0 - 4		
Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	15	20	35

Course Content same as IBSMSASMJ101 above.

Course Name: Biological and Clinical Instrumentation

Course Code: IBSMSASSE101

Course Type: SEC (Practical)	Course Details: SEC-1		L-T-P: 0 - 1 - 4		
Credit: 3	Full Marks: 50	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30		20	

Course Learning Outcomes:

After the completion of the course, the students will have the ability to:

- *Develop an understanding of the various instruments used in life and medical sciences.*
- *Fundamental knowledge of the applications of the instruments in animal biology will increase the interest amongst the pupils to pursue the course.*
- *Develop a critical understanding of how biological and clinical instruments are operated.*
- *Connect the theoretical and practical knowledge on the study of animals in a broader sense.*

Course Content:

Principal & Practical (3 credits)		
Unit	Course content	Hours
I	Microscopy: 1. Good laboratory practices. 2. Principles and applications of microscopy (Optical, Phase Contrast, Electron, Fluorescence, and Confocal).	20
II	Separation & Characterization techniques: 1. Principle and applications of Centrifugation, Sterilization techniques (dry and wet), and Autoclave. 2. Principle and applications of UV/visible, IR, Mass, and ESR spectroscopy.	20

	3. Principle and applications of Chromatography.	
III	Analytical techniques: 1. Principle and applications of Immunofluorescence, RIA, ELISA, PCR, RT-PCR. 2. Principle and applications of Biosafety chamber, Cryopreservation, and Gel doc system.	20
IV	Biomedical imaging: 1. Principle and applications of Electrocardiogram (ECG), Electroencephalogram (EEG), and Magnetic Resonance Imaging (MRI). 2. Principle and applications of X-Ray, Ultrasonography, and Pacemaker.	20
		80
Suggested Readings:		
<ol style="list-style-type: none"> 1) Reynolds A. & Estridge B. (2011). Basic Clinical Laboratory Techniques. Delmar Cengage Learning; 6th edition. 2) Hofmann A. & Clokie S. (2018). Wilson And Walker's Principles and Techniques of Biochemistry and Molecular Biology Paperback. Cambridge University Press; 8th edition. 3) Miller K. (2019). Linne & Ringsrud's Clinical Laboratory Science: Concepts, Procedures, and Clinical Applications. Mosby; 8th edition. 4) Pandey O.N. (2019). Fundamentals of Biomedical Instrumentation. S.K. Kataria & Sons, 5th edition. 		

Semester - 2

Course Name: Diversity of Chordates

Course Code: IBSMSASMJ201

Course Type: Major (Theoretical & Practical)	Course Details: MJC-2		L-T-P: 3 - 0 - 4		
Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	15	20	35

Course Learning Outcomes:

After the completion of the course, the students will have the ability to:

- Develop an understanding of the diversity of vertebrate life.
- Group vertebrate animals on the basis of their morphological characteristics/ structures.
- Understand the relative position of individual organs and associated structures through the dissection of the invertebrate representatives.
- Realize that very similar physiological mechanisms are used in very diverse organisms.
- Have an overview of the evolutionary concepts including homology and homoplasy, and detailed discussions of major organ systems.
- Engage in the field-based study of the biodiversity research activities to understand well the theoretical aspects taught and gather data in the field.

Course Content:

Theory (3 credits)		
Unit	Course content	Hours
I	1. General characteristics and outline classification of Phylum Chordata (Young, 1981). 2. Theories on the origin of Chordates.	2
II	Protochordate: 1. Concept of Protochordates (Hemichordata, Urochordata and Cephalochordata). 2. Retrogressive metamorphosis in <i>Ascidia</i> . 3. Anatomical peculiarities of <i>Balanoglossus</i> and <i>Branchiostoma</i> .	4
III	Fish: 1. General characteristics and classification of Fishes up to Sub-Classes (Nelson, 2006). 2. Accessory respiratory organ, Swim bladder, and Acoustico-lateralis system in fish. 3. Anatomical peculiarities of Agnatha. 4. Evolutionary significance of <i>Dipnoi</i> . 5. Type study: <i>Scoliodon</i> .	10
IV	Amphibia: 1. General characteristics and classification up to living Orders (Young, 1981). 2. Metamorphosis and Parental Care in Amphibia. 3. Type study: <i>Duttaphrynus</i> .	8
V	Reptilia: 1. General characteristics and classification up to living Orders (Young, 1981). 2. Poison apparatus, biting mechanism, and venom in Snakes.	8

	3. Evolutionary significance of <i>Sphenodon</i> . 4. Type study: <i>Calotes</i> .	
VI	Aves: 1. General characteristics and classification up to Sub-Classes (Young, 1981). 2. Migration and Flight (principal and aerodynamics) in Birds. 3. Type study: <i>Columba</i> .	8
VII	Mammals: 1. General characteristics and classification up to living Orders (Young, 1981). 2. Evolutionary significance of Prototheria. 3. Echolocation in Microchiropterans and Cetaceans. 4. Type study: <i>Cavia</i> .	8
		48
Suggested Readings: 1) Sinha K.S., Adhikari S., Ganguly, B.B. & Goswami B. (2012). Biology of Animals. Vol. II. New Central Book Agency. 2) Chatterjee A. & Chakraborty C. (2015). Text Book of Zoology. Nirmala Library. 3) Jordan E.L. & Verma P.S. (2003). Chordate Zoology. S. Chand & Company Ltd. 4) Kotpal R.L. (2019). Modern Text Book of Zoology: Vertebrates. 4 th Ed. Rastogi Publications. 5) Nelson J.S. (2006). Fishes of the World, 4 th Ed. Wiley. 6) Parker T.J. & Haswell W. (1972). Text Book of Zoology, Volume II: Marshall and Williams (Eds.) 7 th Ed. Macmillan. 7) Romer A.S. & Parsons T.S. (1986). The vertebrate body. 6 th Ed. Saunders College Pub. 8) Young J.Z. (1981). The Life of Vertebrates. 3 rd Ed. Oxford University Press.		

Practical (2 credits)	
1. Identification (Systematic Position and specimen characters): <i>Balanoglossus</i> , <i>Herdmania</i> , <i>Branchiostoma</i> , <i>Petromyzon</i> , <i>Myxine</i> , <i>Scoliodon</i> , <i>Sphyrna</i> , <i>Pristis</i> , <i>Torpedo</i> , <i>Harpadon</i> , <i>Labeo</i> , <i>Mystus</i> , <i>Anguilla</i> , <i>Exocoetus</i> , <i>Hippocampus</i> , <i>Echeneis</i> , <i>Ichthyophis</i> , <i>Necturus</i> , <i>Salamandra</i> , <i>Axolotl</i> larva, <i>Duttaphrynus</i> , <i>Rana</i> , <i>Hyla</i> , <i>Alytes</i> , Tadpole, <i>Chelone</i> , <i>Tryonyx</i> , <i>Hemidactylus</i> , <i>Chamaeleon</i> , <i>Draco</i> , <i>Bungarus</i> , <i>Vipera</i> , <i>Naja</i> , <i>Hydrophis</i> , <i>Psittacula</i> , <i>Passer</i> , <i>Alcedo</i> , <i>Pteropus</i> , <i>Funambulus</i> , <i>Suncus</i> . 2. Key for Identification of poisonous and non-poisonous snakes. 3. Dissection of the Digestive System and Brain of Carp. 4. Dissection of the V th & VII th Cranial Nerve from Fowl head. 5. Mounting: Different types of scales in Fish, Pecten from Fowl head. 6. Educational excursion to any biodiversity rich place and submission of a field report.	64 Hours
Suggested Readings: 1) Ghosh K. & Manna B. (2015). Practical Zoology, New Central Book Agency, Kolkata. 2) Lal S.S. (2016). Practical Zoology - Invertebrate. Rastogi Publication. 3) Sinha J.K., Chatterjee A.K. & Chattopadhyay P. (2015). Advanced Practical Zoology. Books and Allied (P) Ltd.	

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Credit: 5	Full Marks: 100	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30	15	20	35

Course Content same as IBSMSASMJ201 above.

Course Name: Laboratory Techniques and Diagnostics

Course Code: IBSMSASSE201

Course Type: SEC (Practical)	Course Details: SEC-2		L-T-P: 0 - 1 - 4		
Credit: 3	Full Marks: 50	CA Marks		ESE Marks	
		Practical	Theoretical	Practical	Theoretical
		30		20	

Course Learning Outcomes:

After the completion of the course, the students will have the ability to:

- *Develop knowledge of principles and working procedures of microbial techniques.*
- *Gain expertise on methods for diagnosis of major non-communicable diseases.*
- *Gain expertise in the handling of laboratory instruments.*
- *Connect the theoretical and practical knowledge on the study of animals in a broader sense.*

Course Content:

Principal & Practical (3 credits)		
Unit	Course content	Hours
I	Cell culture: 1. Principle and process of microbial culture, preservation, and identification. 2. Gram staining. 3. Culture and preservation of animal cells (Rat peritoneal macrophages).	10
II	Histology & staining: 1. Principle and applications of histological techniques (Microtomy) and tissue identification. 2. Isolation and identification of endoparasites from hosts (Chicken and Goat intestines). 3. Thin and thick blood smear preparation for identification of blood parasites.	20

III	Hematology & Clinical biochemistry: 1. Principle and applications: Blood glucose test using strips, Lipid profile, Erythrocyte sedimentation rate, Total erythrocyte count, Total and differential leucocyte count, Hemoglobin estimation, Clotting time, Bleeding time. 2. Blood grouping, Blood pressure. 3. Pulse and Heartbeat, Body temperature, BMI.	25
IV	Diagnostic techniques: 1. Principle and applications of Liver function test (SGPT, SGOT, ALP, and bilirubin) 2. Principle and applications of Kidney function test (methylene blue excretion test) and urine analysis (albumin, and creatinine test). 3. IgE test, Widal test, Antibody rapid test kit. 4. Pulmonary function test (Spirometer, Oximeter) 5. Myopia, Hyperopia, Astigmatism.	25
		80
Suggested Readings: 1) Reynolds. A. & Estridge B. (2011). Basic Clinical Laboratory Techniques. Delmar Cengage Learning; 6th edition. 2) Miller K. (2019). Linne & Ringsrud's Clinical Laboratory Science: Concepts, Procedures, and Clinical Applications. Mosby; 8th edition. 3) Jones T.C., Hunt R.D. & King N.W. (1997). Veterinary Pathology. Blackwell Publishing. 4) Freifelder D. (1983). Physical biochemistry: applications to biochemistry and molecular biology. W.H. Freeman, 2nd edition.		

Semester - 3