UNIVERSITY OF NORTH BENGAL

Accredited by NAAC with grade "B++"

B.Sc. Zoology FOUR YEAR UNDERGRADUATE PROGRAM
(FYUGP)
w.e.f. 2024-2025

Course Curriculum for B.Sc. Zoology Minor (For both single Major single Minor & Multidisciplinary course)

Under
THE NEW CURRICULUM AND CREDIT FRAMEWORK, 2024

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B.Sc. Zoology

Minor

UNIVERSITY OF NORTH BENGAL
RAJA RAMMOHANPUR, DARJEELING
WEST BENGAL
PIN-734013

FYUGP COURSE STRUCTURE OF ZOOLOGY
(SINGLE MAJOR WITH SINGLE MINOR)

Semester	Major Courses (Credit)	Skill Enhancement Courses (Credit)	Minor Courses (Credit)	Inter-disciplinary Courses (Credit)	Ability Enhancement Compulsory Courses (Credit)	Value Added Courses (Credit)	Semester-wise Credit
I	MAJ-1 (4) MAJ-2 (4)	SEC-1(3) (Anyone from the list provided by the college)	MIN-1 Non-Chordates (4)			VAC-Environmental Education (4)	19
II	MAJ-3 (4) MAJ-4 (4)	SEC-2 (3) (Anyone from the list provided by the college)	MIN-2 Chordates (4)	IDC-1 (3) (Anyone from the list provided by the college)	AECC-Comp. ENG.-(4)		22
III	MAJ-5 (4) MAJ-6 (4)	SEC-3 (3) (Anyone from the list provided by the college)	MIN-3 Cell Biology (4)	IDC-2 (3) (Anyone from the list provided by the college)	AECC-MIL/ALT.ENG.-(4)		22
IV	MAJ-7 (4) MAJ-8 (4)	Internship(2)*	MIN-4 Genetics (4)	IDC-3 (3) (Anyone from the list provided by the college)		VAC-Understanding India (4)	19+2
V	MAJ-9 (4) MAJ-10 (4) MAJ-11 (4) MAJ-12 (4)		MIN-5 Biochemistry (4)				20
VI	MAJ-13 (4) MAJ-14 (4) MAJ-15 (4) MAJ-16 (4)		MIN-6 Physiology (4)				20
VII	MAJ-17 (4) MAJ-18 (4) MAJ-19 (4)		MIN-7 Applied Zoology-1 (4)				16
III	MAJ-20 (4) MAJ-21 (4) MAJ-22 (4) MAJ-23 G (4)		MIN-8 Applied Zoology-2 (4)				20

*** Should be completed at the end of 2nd/4th semester during summer recess**

FYUGP COURSE
STRUCTURE OF ZOOLOGY (MULTIDISCIPLINARY)

Semester	Major Courses -1 (Credit)	Major Courses -2 (Credit)	Optional Major Courses (Credit)	Skill Enhancement Courses (Credit)	Minor Courses (Credit)	Inter-disciplinary Courses (Credit)	Ability Enhancement Compulsory Courses (Credit)	Value Added Courses (Credit)
I	DSC-1 (4)	DSC-1 (4)		SEC-1(3) (Anyone from the list provided by the college)	MIN-1 Non-Chordates (4)			VAC-Understanding India (4)
II	DSC-2 (4)	DSC-2 (4)		SEC-2 (3) (Anyone from the list provided by the college)	MIN-2 Chordates (4)	IDC-1 (3) (Anyone from the list provided by the college)	AECC-MIL/ALT.ENG.-(4)	
III	DSC-3 (4)	DSC-3 (4)		SEC-2 (3) (Anyone from the list provided by the college)	MIN-3 Cell Biology (4)	IDC-2 (3) (Anyone from the list provided by the college)	AECC-Comp. ENG.-(4)	
IV	DSC-4 (4)	DSC-4 (4)		Internship (2)*	MIN-4 Genetics (4)	IDC-3 (3) (Anyone from the list provided by the college)		VAC-Environmental Education (4)
V	DSC-5 (4) DSC-6 (4)	DSC-5 (4) DSC-6 (4)			MIN-5 Biochemistry (4)			
VI	DSC-7 (4) DSC-8 (4)	DSC-7 (4) DSC-8 (4)			MIN-6 Physiology (4)			
VII	DSC-9 (4)**	DSC-9 (4)**	DSC-12 Research Methodology *** DSC-13 Comparative Anatomy & Functional Biology (4) #		MIN-7 Applied Zoology-1 (4)			
VIII	DSC-10 (4) ** DSC-11 (4) **	DSC-10 (4) ** DSC-11 (4) **	DSC-14 Gamete biology and embryology (4) # DSC-15 Ecology (4) #		MIN-8 Applied Zoology-2 (4)			

* Should be completed at the end of 2nd/4th semester during summer recess

** For candidates 'without research' and for the candidates 'with research' these 3 courses will be replaced by Research Project/Dissertation (12)

*** To be chosen from either of the Major papers

For the candidates who will opt Zoology as single major during last two semester

Semester I

Minor 1: NON-CHORDATES
(Paper Code: ZOOLMIN101)
Paper Type: Theory + Practical Lab Based [TH+PLB]
Credit: 4 (Theory 3+ Practical 1)
Class Hours: 75 (Theory 45 hrs. + Practical 30 hrs.)
Full Marks: 80 (Theory 60 + Practical 20)
Duration of end semester examination: (Theory 2.5 hrs. + Practical 2 hrs.)

Syllabus:

Theory	**Class Hour(s)**
Unit I: Introduction to Non-chordates	**01**
• Basis of classification of Kingdom Animalia into different phyla.	
Unit II: Protista	**06**
• General characteristics and classification up to phyla. • Locomotory organelles in *Amoeba, Euglena* and *Paramoecium* Life cycle of *Plasmodium vivax*	
Unit III: Porifera	**04**
• General characteristics and classification up to classes. • Canal system in sponges.	
Unit IV: Cnidaria and Ctenophora	**07**
• General characteristics and classification up to classes. • Polymorphism in Cnidaria. • Types of coral reefs.	
Unit V: Platyhelminthes and Nematoda	**08**
• General characteristics and classification up to classes. • Life cycle of *Taenia solium* and *Ascaris lumbricoides* along with their parasitic adaptation.	
Unit VI: Annelida	**03**
• General characteristics and classification up to classes. • Metamerism in Annelida	
Unit VII: Arthropoda	**06**
• General characteristics and classification up to classes. • Vision in Insecta. • Metamorphosis in Lepidoptera	
Unit VIII: Mollusca	**04**
• General characteristics and classification up to classes. • Respiration in *Pila* Pearl Culture	
Unit IX: Echinodermata	**04**
• General characteristics and classification up to classes. • Water-vascular System in Asteroidea.	
Unit X: Hemichordata	**02**
• General characteristics.	

Note: *Outline classification of the kingdom Protista up to phyla to be followed from Levine et al. (1980) and that of other phyla up to classes to be followed from "Ruppert, Fox and Barnes (2003): Invertebrate Zoology: A Functional Evolutionary Approach". VII Edition or from Brusca, R.C and Brusca, G. J (2003): Invertebrate (2nd ed.) Sinauer Associates Inc., Publishers Sunderland.*

Practical	**30 Hours**

- Museum study (Spot identification)
  (i) Protozoa: *Euglena, Paramecium* , *Amoeba,* .
  (ii) Porifera: *Sycon, Hyalonema,*
  (iii) Cnidaria: *Aurelia, Gorgonia*, , *Metridium.*
  (iv) Platyhelminthes: *Fasciola hepatica, Taenia solium*.
  (v) Nematoda: *Ascaris lumbricoides* (male and female).
  (vi) Annelida: *Nereis, Pheretima, Hirudinaria.*
  (vii) Arthropoda: *Limulus, Peripatus, Palaemon, Daphnia, , Cancer, Eupagurus, Scolopendra, Julus, Bombyx, Periplanta, Apis.*
  (viii) Mollusca: *Chiton, , Pila, Unio, Octopus.*
  (ix) Echinodermata: *Asterias, Echinus, Antedon.*

- Mounting: *Cyclops, Daphnia, Mysis*

Note: *In case of unavailability of preserved specimens/slides, departments can use photographs for the study of museum specimens and permanent slides*

Evaluation Structure for end semester practical examination:

1. Identification: 4 specimen/each 3 marks (Identification = 1, Systematic position (as per theory syllabus)= 1, Characters = 1), Total = 12 marks
2. Mounting and Identification Any one: 4 marks (Staining:1, Mounting:1, Spot Identification: 1, Characters = 1)
3. Laboratory Note Book: 2 marks (Based on the neatness, inclusiveness, overall presentation and regularity)
4. Viva-Voce: 2 marks (Testing of Knowledge in the said Course)

Semester II

Minor 2: CHORDATES
(Paper Code: ZOOMIN202)
Paper Type: Theory + Practical Lab Based [TH+PLB]
Credit: 4 (Theory 3+ Practical 1)
Class Hours: 75 (Theory 45 hrs. + Practical 30 hrs.)
Full Marks: 80 (Theory 60 + Practical 20)
Duration of end semester examination: (Theory 2.5 hrs. + Practical 2 hrs.)

Syllabus:

Chordates —Theory (3 credits) **45 Hours/60 marks**	**Class**
Unit 1: Chordata Salient features	1
Unit 2: Protochordata Salient features and phylogeny of protochordates; Structure of pharynx and ciliary mode of feeding in *Branchiostoma*	5
Unit 3: Agnatha General features of Agnatha and classification of cyclostomes up to classes	2
Unit 4: Pisces General characters and classification up to Classes; Scales in fishes; Migration of fishes; Parental Care in fishes; Swimbladder in fishes	10
Unit 5: Amphibia General characters and classification up to extant Order; Parental care in amphibians	5
Unit 6: Reptilia General Characters and classification up to extant Order; Differences between poisonous and non-poisonous snakes; Poison apparatus and biting mechanism in snakes	6
Unit 7: Aves General characters and classification up to Sub-class; Flight adaptations; Aerodynamics of flight; exoskeleton in birds	8
Unit 8: Mammalia General Characters and classification up to Infra-Class; Adaptive Radiation in mammals; Integumentary glands in mammals and their derivatives	8

Note: Classification of Protochordata, Reptilia, Aves & Mammals to be followed from Young (1981), for Pisces to be followed from Romer (1959), for Amphibia to be followed from Duellman & Trieb (1986)/ Young (1981).

List of Practical (1 credit) **30 hours/20 marks**

1. Spot identification (specimen/ photograph):

Ascidia, Herdmania, Branchiostoma, Petromyzon, Sphyrna, Torpedo, Scoliodon, stingray, *Pristis. Labeo, Catla, Hippocampus, Exocoetus, Ichthyophis/Ureotyphlus, Tylototriton, Bufo, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus,* any three common birds-(Crow, duck, Owl), Squirrel and Bat.

2. Temporary mounts of aqueous eosin stained placoid/cycloid/ctenoid scales.
3. Study of disarticulated skeleton of toad and pigeon.

Evaluation Structure for end semester practical examination:

1. Identification: 3 specimen/each 2 marks (Identification = ½, Characters = 1½), Total = 06 marks
2. Bones identification: 4 specimens/each 2 marks (one each from skull, limb bones, girdles and vertebra) (Identification = ½, Characters = 1½), Total = 08 marks
3. Mounting and Identification Any one: 2 marks (Staining: ½, Mounting: ½, Spot Identification: 1)
4. Laboratory Note Book: 2 marks (Based on the neatness, inclusiveness, overall presentation and regularity)
5. Viva-Voce: 2 marks (Testing of Knowledge in the said Course)

Suggested Readings

1. Berg, L.S. (1940). Classification of fishes both recent and fossil. Trudy Zoologischeskogo Instituta. 5:85-517.
2. Duellman, W.E. and Trueb, L. (1986). Biology of Amphibians. Mc. Graw Hill Books Company.
3. Hall, B.K. and Hallgrimsson, B. (2008). Strickberger's Evolution. IV Edition, Jones and Bartlett Publishers Inc.
4. Jordan, E.L. and Verma, P.S. (2003). Chordate Zoology. S. Chand & Company Ltd., New Delhi.
5. Kardong, K.V. (2002). Vertebrates: Comparative anatomy, function evolution. Tata McGraw Hill.
6. Kent, G.C. and Carr, R.K. (2001). Comparative anatomy of the Vertebrates. IX Edition, McGraw Hill.
7. Nelson, J.S. (2006). Fishes of the World. IV Edition, Wiley.
8. Parker, T.J. and Haswell, W. (1972). Text Book of Zoology, Volume II. VII Edition, Marshall and Willam (eds.), Macmillan Press, London.
9. Pough, H. Vertebrate life. VIII Edition, Pearson International.
10. Romer, A.S. (1959). The Vertebrate Story. University of Chicago Press.
11. Romer, A.S. and Parsons, T.S. (1986). The vertebrate body. VI Edition, Saunders College Publishing.
12. Young, J. Z. (1981). The Life of Vertebrates. III Edition, ELBS, Oxford.
13. Young, J.Z. (2004). The Life of Vertebrates. III Edition (Indian Edition), Oxford University press.

Question Pattern for MAJ, DSC, MIN & AEC (Theoretical)

Sl. No.	Questions to be answered	Out of	Marks of each question	Total Marks
1	4	6	3	4 × 3 = 12
2	4	6	6	4 × 6 = 24
3	2	4	12	2 × 12 = 24