Ch. Ranbir Singh University, Jind

Scheme of Examination and Syllabus for Under-Graduate Programme (Subject: Zoology)

Under Multiple Entry-Exit, Internship and CBCS-LOCF in accordance to NEP-2020 w.e.f. 2024-25 (in phased manner)

Under Multiple Entry-Exit, Internship and CBCS-LOCF in accordance to NEP-2020
w.e.f. 2024-25 (in phased manner)
Subject: Zoology

SEMESTER-1									
Remarks	**Course Type**	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
Scheme A	**CC-1 4 credit**	B24-ZOO-101	Animal Diversity of Non-Chordates	2	2	15	35	50	3 hrs.
			Practical	2	4	15	35	50	4 hrs.
Scheme A	**CC-M1 2 credit**	B24-ZOO-103	Introduction of Non-Chordates	1	1	10	20	30	3 hrs.
			Practical	1	2	5	15	20	4 hrs.
Scheme A	**MDC-1 3 credit**	B24-ZOO-104	Basics of Zoology-I	2	2	15	35	50	3 hrs.
			Practical	1	2	5	20	25	4 hrs.
SEMESTER-2									
Remarks	**Course Type**	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
Scheme A	**CC-2 4 credit**	B24-ZOO-201	Animal Diversity of Chordates	2	2	15	35	50	3 hrs.
			Practical	2	4	15	35	50	4 hrs.
Scheme A	**CC-M2 2 credit**	B24-ZOO-203	Introduction of Chordates	1	1	10	20	30	3 hrs.
			Practical	1	2	5	15	20	4 hrs.
Scheme A	**MDC-2 3 credit**	B24-ZOO-204	Basics of Zoology-II	2	2	15	35	50	3 hrs.
			Practical	1	2	5	20	25	4 hrs.

ZOOLOGY: SEMESTER-I									
Remarks	**Course Type**	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
Scheme A	**CC-1 4 credit**	**B24-ZOO-101**	**Animal Diversity of Non-Chordates**	**2**	**2**	**15**	**35**	**50**	**3 hrs.**
			Practical	**2**	**4**	**15**	**35**	**50**	**4 hrs.**

Level of the course: 100-199

Pre-requisite for the course (if any): Biology as a Subject at 4.0 Level (Class XII)

Course Learning Outcomes (CLO)

1. Student will be able to describe unique characters and recognize life forms of phylum Protozoa and Porifera
2. Student will be able to describe unique characters and recognize life forms of phylum Coelenterata and Helminthes
3. Student will be able to describe unique characters and recognize life forms of phylum Annelida and Arthropoda
4. Student will be able to describe unique characters and recognize life forms of phylum Mollusca, Echinodermata and Hemichordates
5. Students will be capable of identifying the characters and classification of Non-Chordates

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	Phylum Protozoa: General characters and classification up to class level Type study of *Plasmodium* Phylum Porifera: General characters and classification up to class level, Type study of *Sycon*	**8**
II	Phylum – Coelentrata: General characters and classification up to class level Phylum – Platyhelminthes and Aschelminthes: General characters and classification up to class level,	**8**
III	Phylum – Annelida: General characters and classification up to class level, Type study of Earthworm, *Pheretima posthuma* (Habitat, habits, metamerism, digestive System, circulatory system, nervous system, reproductive system) Phylum – Arthropoda: General characters and classification up to class level,	**7**
IV	Phylum - Mollusca: General characters and classification up to class level, Type study of *Pila* Phylum – Echinodermata: General characters and classification up to class level, Phylum Hemichordata: General characters of Hemichordates with examples	**7**
V Practical	Classification up to orders with ecological note and economic importance of the following animals: 1.Protozoa: Lamination of cultures of Amoeba, Euglena and Paramecium; permanent prepared slides: Amoeba, Euglena, Trypanosoma, Noctiluca, Eimeria, Paramecium (binary fission and conjugation), Opalina, Vorticella, Balantidium, Nyctotherus, radiolarian and formaniferan ooze. 2.Parazoa (Porifera): Sycon, Grantia, Euplectella, Hyalonema, Spongilla, Euspongia 3.Coelenterata: Porpita, Valella, Physalia, Aurelia, Rhizostoma, Metridium, Millipora, Alcyonium, Tubipora, Zoanthus, Madrepora, Favia, Fungia, and Astrea. Permanent prepared slides: Hydra (W.M.), Hydra with buds, Obelia (colony and medusa), Sertularia, Plumularia, Tubularia, Bougainvillea, Aurelia (sense organs and stages of life history). Type Study of Obelia. 4.Playhelminthes: Dugesia, Fasciola, Taenia, Echinocoecus. Permanent prepared slides: Miracidium, Sporocyst, Redia, Cercaria, Scolex and Proglotttids of Taenia (mature and gravid). Type study of Liver Fluke, Fasciola hepatica. 5.Aschelminthes: Ascaris (male and female), Trichinella, Ancylostoma, Meloidogyne 6.Annelida: Pheretima, Heteronereis, Polynoe, Aphrodite, Chaetopterus, Arenicola, Tubifex and Pontobdella	**60**

	7. Arthropoda: *Peripatus, Palaemon* (Prawn), *Lobster, Cancer* (crab), *Sacculina, Eupagurus* (hermit crab), *Lepas, Balanus,Cyclops, Daphnia, Lepisma, Periplaneta* (cockroach), *Schistocerca* (locust), *Poecilocerus* (ak-hopper), *Gryllus* (cricket), *Mantis* (praying mantis), *Cicada, Forticula* (earwig), Dragon fly, termite queen, bug, moth, beetle, *Polistes* (wasp), *Apis* (honey bee), *Bombyx* (silk moth), *Cimex* (beg bug), *Pediculus* (body louse), *Millipede, Scolopendra* (centipede), *Palamnaeus* (scorpion), *Aranea* (spider), *Limulus* (king crab) Type study of Cockroach, *Periplaneta americana* (Habitat, habits, external morphology, digestive system, respiratory system, excretory system, reproductive system). 8. Mollusca: *Mytilus, Ostrea, Cardium, Pholas, Solen* (razor/Fish), *Pecten, Holiotis, Patella, Aplysia, Doris, Limax, Loligo, Sepia, Octopus, Nautilus* (complete and T.S.), *Chiton* and *Dentalium* 9. Echinodermata: *Asterias, Echinus, Cucumaia, Ophiothrix, Antedon a*nd *Asterophyton* Type study of *Asterias* (Sea Star) (Habitat, habits, external morphology, water vascular system, Circulatory System) 10. Hemichordata: *Balanoglossus* 11. Study of slides of Non-Chordates phyla; Staining of *Obelia* and *Sertularia*	

Suggested Evaluation Methods

Internal Assessment:	**End Term Examination:**
➢ **Theory** ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.: 4 ● Mid-Term Exam: 7 ➢ **Practicum** ● Class Participation: 4 ● Seminar/Demonstration/Viva-voce/Lab records etc.: 4 ● Collection Report: 7	➢ **Theory** ● Written Examination: 35 ➢ **Practicum** Practical Examination: 35

Learning Resources

1. Jordan, E.L and P.S. Verma. 2009. Invertebrate Zoology, S.Chand and Co. Ltd. New Delhi.
2. Ayyar, E.K and T. Ananthakrishnan. 1992. Manual of Zoology Vol.1 Invertebrates Part I and II, S.Viswanathan Printers and Publishers Pvt. Ltd. Madras.
3. Kotpal, R.L. 2021. Zoology Invertebrates. Rastogi Publications, Meerut.
4. Nair, N.C., N. Arumugam, N. Soundarapandian, T. Murugan and S. Leelavathy. 2010. A textbook of Invertebrates. Saras Publication, Nagercoil.
5. Rastogi V.B. 2021 . Invertebrate Zoology. Kedar Nath Ram Nath , Meerut
6. Lal S.S. (2019) Practical Zoology Invertebrates. Rastogi Publications, Meerut
7. Anderson D.T. (1999) Invertebrate Zoology, Oxford University Press
8. Edward E. Ruppert, Robert D. Barnes (1994)· Invertebrate Zoology ; Saunders College Pub.

ZOOLOGY: SEMESTER-I

Remarks	Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
Scheme A	CC-M1 2 credit	B24-ZOO-103	Introduction of Non-Chordates	1	1	10	20	30	3 hrs.
			Practical	1	2	5	15	20	4 hrs.

Level of the course: 100-199

Pre-requisite for the course (if any): NA

Course Learning Outcomes (CLO)

1. Student will be able to understand about phylum Protozoa and Porifera
2. Student will be able to understand about phylum Coelenterata and Helminthes
3. Student will be able to understand about phylum Annelida and Arthropoda
4. Student will be able to understand about phylum Mollusca, Echinodermata and Hemichordates
5. Students will be capable of identifying the characters and classification of Non-Chordates

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	Phylum Protozoa: General characters and classification of Protozoa with their ecological and economic importance Phylum Porifera: General characters and classification of Porifera with their ecological and economic importance	4
II	Phylum – Coelentrata: General characters and classification of Coelentrata with their ecological and economic importance Phylum – Platyhelminthes and Aschelminthes: General characters and classification of Helminthes with their ecological and economic importance	4
III	Phylum – Annelida: General characters and classification of Annelida with their ecological and economic importance Phylum – Arthropoda: General characters and classification of Arthropods with their ecological and economic importance	4
IV	Phylum - Mollusca: General characters and classification of Mollusca with their ecological and economic importance Phylum – Enchinodermata: General characters and classification of Echinoderms with their ecological and economic importance Phylum Hemichordata: General Characters of Hemichordates with examples	3
V Practical	Classification up to orders with ecological note and economic importance of the following animals: 1. Protozoa: Permanent slides: *Amoeba, Euglena, Trypanosoma, Noctiluca, Eimeria, Paramecium* (binary fission and conjugation), *Opalina, Vorticella, Balantidium, Nyctotherus,* radiolarian and formaniferan ooze. 2. Porifera: *Sycon, Grantia, Euplectella, Hyalonema, Spongilla, Euspongia* 3. Coelenterata: *Porpita, Valella, Physalia, Aurelia, Rhizostoma, Metridium, Millipora, Alcyonium, Tubipora, Zoanthus, Madrepora, Favia, Fungia,* and *Astrea.* Permanent slides of *Hydra* (W.M.), *Hydra* with buds, *Obelia* (colony and medusa), *Sertularia, Plumularia, Tubularia, Bougainvillea, Aurelia*. 4. Playhelminthes: *Dugesia, Fasciola, Taenia, Echinocoecus.* Permanent prepared slides: *Miracidium, Sporocyst, Redia, Cercaria, Scolex* and *Proglotttids of Taenia* (mature and gravid). Aschelminthes: *Ascaris* (male and female), *Trichinella, Ancylostoma, Meloidogyne* 5. Annelida: *Pheretima, Heteronereis, Polynoe, Aphrodite, Chaetopterus, Arenicola, Tubifex* and *Pontobdella* 6. Arthropoda: *Peripatus, Palaemon* (Prawn), *Lobster, Cancer* (Crab), *Sacculina, Eupagurus* (Hermit crab), *Lepas, Balanus,Cyclops, Daphnia, Lepisma, Periplaneta* (cockroach), *Schistocerca* (Locust), *Poecilocerus* (ak-hopper), *Gryllus* (cricket), *Mantis* (praying mantis), *Cicada, Forticula* (earwig), Dragon fly, termite queen, bug, moth, beetle, *Polistes* (wasp), *Apis* (Honey bee), *Bombyx* (Silk moth), *Cimex* (Bed bug), *Pediculus* (Head louse), *Millipede, Scolopendra* (centipede), *Palamnaeus* (scorpion), *Aranea* (spider), *Limulus* (king crab) 7. Mollusca: *Mytilus, Ostrea, Cardium, Pholas, Solen* (razor / Fish), *Pecten, Holiotis, Patella, Aplysia, Doris, Limax, Loligo, Sepia, Octopus, Nautilus* (complete and T.S.), *Chiton* and *Dentalium* 8. Echinodermata: *Asterias, Echinus, Cucumaia, Ophiothrix, Antedon a*nd *Asterophyton* 9. Hemichordata: *Balanoglossus*	30

Suggested Evaluation Methods

Internal Assessment:	**End Term Examination:**
➢ **Theory** ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.: NA ● Mid-Term Exam: 6 ➢ **Practicum** ● Class Participation: NA ● Seminar/Demonstration/Viva-voce/Lab records etc.: 5 ● Mid-Term Exam: NA	➢ **Theory** ● Written Examination: 20 ➢ **Practicum** ● Practical Examination: 15

Learning Resources

1. Jordan, E.L and P.S. Verma. 2009. Invertebrate Zoology, S.Chand and Co. Ltd. New Delhi.
2. Ayyar, E.K and T. Ananthakrishnan. 1992. Manual of Zoology Vol.1 Invertebrates Part I and II, S.Viswanathan Printers and Publishers Pvt. Ltd. Madras.
3. Kotpal, R.L. 2021. Zoology Invertebrates. Rastogi Publications, Meerut.
4. Nair, N.C., N. Arumugam, N. Soundarapandian, T. Murugan and S. Leelavathy. 2010. A textbook of Invertebrates. Saras Publication, Nagercoil.
5. Rastogi V.B. 2021 . Invertebrate Zoology. Kedar Nath Ram Nath , Meerut
6. Lal S.S. 2019. Practical Zoology Invertebrates. Rastogi Publications, Meerut
7. Anderson D.T. (1999) Invertebrate Zoology, Oxford University Press
8. Edward E. Ruppert, Robert D. Barnes (1994)· Invertebrate Zoology ; Saunders College Pub.

ZOOLOGY: SEMESTER-I									
Remarks	**Course Type**	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
Scheme A	**MDC-1 3 credit**	**B24-ZOO-104**	**Basics of Zoology-I**	**2**	**2**	**15**	**35**	**50**	**3 hrs.**
			Practical	**1**	**2**	**5**	**20**	**25**	**4 hrs.**

Level of the course: 100-199

Pre-requisite for the course (if any): NA

Course Learning Outcomes (CLO)

1. Student will be able to learn about Kingdom Animalia
2. Student will be able to learn about Chordates
3. Student will be able to describe unique characters and recognize life functions of phylum Annelida and Arthropoda
4. Student will be able to describe unique characters and recognize life functions of phylum Mollusca, Echinodermata and Hemichordates
5. Students will be capable understand the role of non chordates in their surroundings

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	Zoology: Definition and scope, introduction to Animal Kingdom, animal characters Non-Chordates and Invertebrates with examples, Invertebrate Phyla, Introduction to basic characters of animal with special reference to the non chordates; Biodiversity: Introduction and Scope; General characters of Protozoa and Porifera; Study of Amoeba and sponges with special reference to its structure and economic importance	**8**
II	General characters of Coelentrata and Annelida; Ecological importance of corals; Morphology of earthworm and its ecological role; Economic importance of Leech	**8**
III	General characters of Arthropoda and Mollusca; Study of basic characters of insects and snails; Insects as pest: Grasshopper, Economic importance of Honey Bee; Snails as pest in Paddy fields	**7**
IV	General characters of Echinodermata; Study of basic characters of Star fish with reference to its role in ecosystem; Economic importance of Star Fish	**7**
V Practical	1. To study the non chordates from pond water 2. To study the different parts of Insects by examining Housefly, butterfly, beetles 3. To study the characters of burrowing non chordates e.g. Earthworm 4. To study the life cycle of Butterfly/Mosquito 5. To study various minor phyla as connecting link 6. Identifications of Non-Chordates specimens of various phyla	**30**

Suggested Evaluation Methods

Internal Assessment:

- **Theory**
  - Class Participation: 4
  - Seminar/presentation/assignment/quiz/class test etc.: 4
  - Mid-Term Exam: 7
- **Practicum**
  - Class Participation: NA
  - Seminar/Demonstration/Viva-voce/Lab records etc.: 5
  - Mid-Term Exam: NA

End Term Examination:

- **Theory**
  - Written Examination: 35
- **Practicum**
  Practical Examination: 20

Learning Resources

1. Jordan, E.L and P.S. Verma. 2009. Invertebrate Zoology, S.Chand and Co. Ltd. New Delhi.
2. Ayyar, E.K and T. Ananthakrishnan. 1992. Manual of Zoology Vol.1 Invertebrates Part I and II, S.Viswanathan Printers and Publishers Pvt. Ltd. Madras.
3. Kotpal, R.L. 2021. Zoology Invertebrates. Rastogi Publications, Meerut.
4. 5. Rastogi V.B. 2021 . Invertebrate Zoology. Kedar Nath Ram Nath , Meerut
6. Lal S.S. (2019) Practical Zoology Invertebrates. Rastogi Publications, Meerut

ZOOLOGY: SEMESTER-2									
Remarks	**Course Type**	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
Scheme A	**CC-2 4 credit**	**B24-ZOO-201**	**Animal Diversity of Chordates**	**2**	**2**	**15**	**35**	**50**	**3 hrs.**
			Practical	**2**	**4**	**15**	**35**	**50**	**4 hrs.**

Level of the course: 100-199

Pre-requisite for the course (if any): Biology as a Subject at 4.0 Level (Class XII)

Course Learning Outcomes (CLO)

1. Student will be able to describe unique characters and recognize life functions of Urochordates
2. Student will be able to describe unique characters and recognize life functions of Pisces
3. Student will be able to describe unique characters and recognize life functions of Amphibians & Reptiles
4. Student will be able to describe unique characters and recognize life functions of Birds & Mammals
5. Students will be capable of identifying the characters and classification of Chordates

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	**Chordates**: Salient features of chordates; Principles of classification; **Protochordates**: Urochordata: Systematic position, distribution, ecology, morphology and affinities	**8**
II	**Pisces**: General characters and classification up to classes with examples emphasizing their biodiversity, Scales & Fins, Type study of *Labeo*	**8**
III	**Amphibia**: General characters and Classification upto class level; Type study of frog, Parental Care and Neoteny in Amphibia **Reptilia:** General characters and Classification upto classes,	**7**
IV	**Aves:** General characters and Classifications upto classes. Flight/Aerial adaptation in birds, *Archaeopteryx* as missing link **Mammals:** General characters and classification up to classes;	**7**
V Practical	1. Classification upto orders, habit, habitats, external characters and economic importance (if any): ● Protochordata: *Molqula, Hetryllus, Pyrosoma, Doliolum, Olikopleura,* and *Amphioxus.* ● Urochordata: Type Study of Herdmania. ● Cyclostomata: *Myxine, Petromyzon* and *Ammocoetus larva*. ● Chondrichthyes: *Zygaena, Pristis, Narcine* (electric ray), *Trygon, Rhinobatus, Raja* and *Chimaera.* ● Osteichthyes: *Acipenser, Lepidosteus, Muraena, Mystus, Catla, Hippocampus, Syngnathus, Exocoetus, Anabas, Diodon, Ostracion, Tetradon, Echinus, Lophius, Solea* and *Polypterus.* Any of the Lung Fishes. ● Amphibia: *Necturus, Proteus, Amphiuma, Salamandra, Ambystoma, Axolotl larva, Alytes, Bufo, Rana*. ● Reptilia: *Hemidactylus, Calotes, Draco, Varanus, Phrynosoma, Chamaeleon, Typhlops, Python, Eryx, Ptyas, Bungarus, Naja, Hydrus, Viper, Crocodilus, Gavialis, Chelone* (Turtle) and *Testudo* (Tortoise). ● Aves: *Casuarius, Arden, Anas, Milvus, Pavo, Eudynamis, Tyto, Alcedo, Halcyon* ● Mammalia: *Ornithorhynchus, Echidna, Didelphis, Macropus, Loris, Macaque, Hystrix, Funambulus, Felix, Panthera, Canis, Herpestes, Capra, Pteropus.* ● Type study of Rat. 2. Study of the skeleton of *Scoliodon, Labeo, Rana* (Frog), *Varanus,* Pigeon or Gallus and *Orcyctolagus*/rat. 3. Study of the following permanent slides: Tornaria larva, T.S. *Amphioxus* (through different regions). Oikopleura, Histology of rat (compound tissues), different types of scales. 4. Make permanent stained preparations of the following: *Salpa,* Spicules, and Pharynx of *Herdmania, Amphioxus*, Cycloid scales 5. Field Visit to Protected areas/National Park/Wildlife Sanctuary or Zoo.	**60**

Suggested Evaluation Methods

Internal Assessment:	End Term Examination:
➢ **Theory** ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.: 4 ● Mid-Term Exam: 7 ➢ **Practicum** ● Class Participation: 4 ● Seminar/Demonstration/Viva-voce/Lab records etc.: 4 ● Collection Report: 7	➢ **Theory** ● Written Examination: 35 ➢ **Practicum** Practical Examination: 35

Learning Resources

1. R.L.Kotpal. Modern Textbook of Zoology
2. E.L. Jordan and Verma. Chordate Zoology.
3. Barrington, E.J.W. The Biology of Hemichordata and Protochordata. Oliver and Boyd, Edinbourgh.
4. Walters, H.E. and Sayles, L.D. Biology of vertebrates. MacMillan & Co., New York.
5. Kent, C.G. Comparative anatomy of vertebrates.
6. S.S. Lal. Practical Zoology Vertebrate

ZOOLOGY: SEMESTER-2									
Remarks	**Course Type**	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
Scheme A	**CC-M2 2 credit**	**B24-ZOO-203**	**Introduction of Chordates**	**1**	**1**	**10**	**20**	**30**	**3 hrs.**
			Practical	**1**	**2**	**5**	**15**	**20**	**4 hrs.**

Level of the course: 100-199

Pre-requisite for the course (if any): NA

Course Learning Outcomes (CLO)

1. Student will be able to describe unique characters of Protochordates
2. Student will be able to describe unique characters of Pisces
3. Student will be able to describe unique characters of Amphibians & Reptiles
4. Student will be able to describe unique characters of Birds & Mammals
5. Students will be capable of identifying the characters and classification of Chordates

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	Chordates: Salient features of chordates; Principles of classification; Origin and evolutionary tree of chordates Protochordates: Urochordata & Cephalochordates: Systematic position, distribution, ecology, morphology and affinities	**4**
II	Cyclostomata: General characters and classification upto class level. Ecological significance of cyclostomes Pisces: General characters and classification up to classes with examples emphasizing their biodiversity, Scales & Fins,	**4**
III	Amphibia: General Characters and Classification upto class level; Parental Care and Neoteny in Amphibia Reptilia: General Characters and Classification upto classes, Extinct reptiles; Poisonous apparatus in snakes	**4**
IV	Aves: General Characters and classifications upto class level. Flight/Aerial adaptation in birds, *Archaeopteryx* as missing link Mammals: General Characters and classification up to class; Adaptive radiations of mammals, dentition in mammals.	**3**
V Practical	1. Classification upto orders, habit, habitats, external characters and economic importance (if any): ● Protochordata: *Molqula, Hetryllus, Pyrosoma, Doliolum, Olikopleura,* and *Amphioxus.* ● Cyclostomata: *Myxine, Petromyzon* and *Ammocoetus larva*. ● Chondrichthyes: *Zygaena, Pristis, Narcine* (electric ray), *Trygon, Rhinobatus, Raja* and *Chimaera.* ● Osteichthyes: *Acipenser, Lepidosteus, Muraena, Mystus, Catla, Hippocampus, Syngnathus, Exocoetus, Anabas, Diodon, Ostracion, Tetradon, Echinus, Lophius, Solea* and *Polypterus.* Any of the Lung Fishes. ● Amphibia: *Necturus, Proteus, Amphiuma, Salamandra, Amblystoma, Axolotl larva, Alytes, Bufo, Rana.* ● Reptilia: *Hemidactylus, Calotes, Draco, Varanus, Phrynosoma, Chamaeleon, Typhlops, Python, Eryx, Ptyas, Bungarus, Naja, Hydrus, Viper, Crocodilus, Gavialis, Chelone* (Turtle) and *Testudo* (Tortoise). ● Aves: *Casuarius, Arden, Anas, Milvus, Pavo, Eudynamis, Tyto, Alcedo, Halcyon* ● Mammalia: *Ornithorhynchus, Echidna, Didelphis, Macropus, Loris, Macaque, Hystrix, Funambulus, Felix, Panthera, Canis, Herpestes, Capra, Pteropus.* 2. Study of the skeleton of *Scoliodon, Labeo, Rana* (Frog), *Varanus,* Pigeon or Gallus and *Orcyctolagus*/rat, Palates of birds, skulls of dog & rabbit. 3. Study of the following prepared slides: Tornaria larva, T.S. *Amphioxus* (through different regions). Oikopleura, Histology of rat (compound tissues), different types of scales. 4. Make permanent stained preparations of the following: *Salpa*, Spicules, and Pharynx of *Herdmania, Amphioxus*, Cycloid scales 5. Field Visit to National Park or Zoo.	**30**

Suggested Evaluation Methods

Internal Assessment:	**End Term Examination:**
➢ **Theory** ● Class Participation: 4 ● Seminar/presentation/assignment/quiz/class test etc.: NA ● Mid-Term Exam: 6 ➢ **Practicum** ● Class Participation: NA ● Seminar/Demonstration/Viva-voce/Lab records etc.: 5 ● Mid-Term Exam: NA	➢ **Theory** ● Written Examination: 20 ➢ **Practicum** Practical Examination: 15

Learning Resources

1. R.L.Kotpal. Modern Textbook of Zoology
2. E.L. Jordan and Verma. Chordate Zoology.
3. Barrington, E.J.W. The Biology of Hemichordata and Protochordata. Oliver and Boyd, Edinbourgh.
4. Walters, H.E. and Sayles, L.D. Biology of vertebrates. MacMillan & Co., New York.
5. Kent, C.G. Comparative anatomy of vertebrates.
6. S.S. Lal. Practical Zoology Vertebrate

ZOOLOGY: SEMESTER-2									
Remarks	**Course Type**	**Course Code**	**Name of the Course**	**Credit**	**Contact Hours/ Week**	**Internal Assessment marks**	**End Term Marks**	**Max. Marks**	**Exam Duration**
Scheme A	**MDC-2 3 credit**	**B24-ZOO-204**	**Basics of Zoology-II**	**2**	**2**	**15**	**35**	**50**	**3 hrs.**
			Practical	**1**	**2**	**5**	**20**	**25**	**4 hrs.**

Level of the course: 100-199

Pre-requisite for the course (if any): NA

Course Learning Outcomes (CLO)

1. Student will learn the role of different groups of chordates in mantling an equilibrium in our ecosystem
2. Students will be able to identify local fishes species and their role in the ecosystem.
3. Course will help to understand how the natural systems on which we depend function.
4. Course will give the idea about how birds are economically important.
5. Student will learn about identification of chordates

Instructions for Paper-Setter

1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

UNIT	TOPICS	CONTACT HOURS
I	**Basics of Chordates:** Define and Salient features of chordates, Difference between non chordates and chordates. Characters of protochordates	**8**
II	**Pisces (Fishes):** Characteristic features of freshwater and marine fishes, Edible fishes of India, Composite fish culture. **Class Amphibia:** Features of amphibians, Parental care in amphibians, Role of amphibians in ecosystem, Identification of turtles and tortoise, Frog and Toad.	**8**
III	**Class Reptilia:** Features of Reptiles, Common reptiles of India, Identification of Poisonous and non poisonous snakes, Difference between crocodile and Gharial	**7**
IV	**Class Aves:** Characteristic features of birds, Common birds of India, Flight adaptations in birds, Commercial uses of birds, Role of birds in agriculture. **Class Mammals:** Characters and economic importance of mammals	**7**
V Practical	1. Identifying feature of different class of chordates 2. Study of connecting links in chordates 3. Study of different types of feathers. 4. Study of different local species of fishes 5. Study of nesting pattern of some local birds, mammals	**30**

Suggested Evaluation Methods

Internal Assessment:

- **Theory**
  - Class Participation: 4
  - Seminar/presentation/assignment/quiz/class test etc.: 4
  - Mid-Term Exam: 7
- **Practicum**
  - Class Participation: NA
  - Seminar/Demonstration/Viva-voce/Lab records etc.: 5
  - Mid-Term Exam: NA

End Term Examination:

- **Theory**
  - Written Examination: 35
- **Practicum**
  Practical Examination: 20

Learning Resources

1. R.L.Kotpal. Modern Textbook of Zoology
2. E.L. Jordan and Verma. Chordate Zoology.
3. Barrington, E.J.W. The Biology of Hemichordata and Protochordata. Oliver and Boyd, Edinbourgh.
4. Walters, H.E. and Sayles, L.D. Biology of vertebrates. MacMillan & Co., New York.
5. Kent, C.G. Comparative anatomy of vertebrates.
6. S.S. Lal. Practical Zoology Vertebrate