

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce, and Science College, Ahmednagar
(Autonomous)
(Affiliated to Savitribai Phule Pune University, Pune)



National Education Policy (NEP)
Choice Based Credit System (CBCS)

Programme Skeleton and Syllabus of
Zoology (Minor) - II Year

Implemented from
Academic Year 2024-25

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
**New Arts, Commerce and Science College, Ahmednagar
(Autonomous)**

Board of Studies in Zoology

Sr. No.	Name	Designation
1.	Prof. Pokale S. N.	Chairman
2.	Dr. Harkal A. D.	Member
3.	Mr. Wakchoure G. G.	Member
4.	Ms. Devdhe G. R.	Member
5.	Ms. Mote S. S.	Member
6.	Ms. Dongare P. N.	Member
7.	Ms. Kalapure P. P.	Member
8.	Prof. R. J. Chavan	Academic Council Nominee
9.	Prof. S. S. Nanware	Academic Council Nominee
10.	Dr. S. S. Teradalkar	Vice-Chancellor Nominee
11.	Prof. B. A. Pawar	Alumni
12.	Mrs. Manjushree Tadvalkar	Industry Expert
13.	Mrs. S. P. Salve	Invitee

1. Prologue

Zoology is one of the major subjects of Basic Sciences and deals with all aspects of animal biology. It includes an interesting range of highly diverse topics. A zoology student needs to understand many areas of the subject to keep pace with advancements in Life Sciences. The Board of Studies has designed this undergraduate degree program in Zoology of New Arts, Commerce and Science College, Ahmednagar (Autonomous) with a substantial component of zoologists' needs as skilled

career zoologists need to pursue post-graduation and further academic studies. It follows the guidelines laid down by the University Grants Commission, New Delhi. This newly designed curriculum is a perfect blend of the classical aspects of Zoology and the advanced and more specialized areas. This degree offers Discipline Specific Core Courses [CC] in Animal Systematics and Diversity, Animal Ecology, Cell Biology, Genetics and Techniques in Biology. In the third year, i.e., Semester V and Semester VI, Discipline-specific Elective Courses [DSEC] and Skill Enhancement Courses [SEC] have been offered. The DSEC courses are Animal Biology, Mammalian Histology, Applied Zoology, Biochemistry, Developmental Biology, Parasitology, Animal Physiology, Molecular Biology, Evolutionary Biology and Entomology. The SEC courses are Computer Applications in Biology, Recombinant DNA Technology and Project. In Semester VI, the students also have a course dedicated to Project work.

The syllabus has been framed so that the student gains each year a broader perspective of the subject as he/ she progresses towards completion of the degree program. Field trips, educational visits and Project work have been included to experience the applications of the theory learned in the classroom. After completing the program, it is expected that students will understand and appreciate: animal diversity, few applications of Zoology, the Structure, functions and life processes at cellular, tissue, organ and system level, the significance of evolution, and basic concepts of human health. The students would also gain an insight into laboratory and fieldwork through the practical course, fieldwork and the project. Presenting this new syllabus to the teachers and students of F.Y.B.Sc. Zoology, we are delighted to state that efforts have been made to seek the inputs of all the stakeholders to make it more relevant. The new course will be effective from 2021-2022 and will follow the Choice Based Credit System in a Semester mode. It has been primed keeping in view the distinctive requirements of B.Sc. Zoology students. The

contents have been drawn up to accommodate the widening prospects of the discipline of Life Sciences. The B.Sc. The zoology program provides an appropriate blend of classical and applied aspects of the subject. This newly designed curriculum will allow students to acquire the skills in handling scientific instruments, planning and performing in the laboratory and exercising critical judgment, independent thinking and problem-solving skills.

2. Programme Outcomes (POs)

- **Disciplinary knowledge and skills:** Capable of demonstrating comprehensive knowledge and understanding of major concepts, theoretical principles and experimental findings in Zoology and its different subfields and other related fields of study, including broader interdisciplinary subfields.
- **Skilled communicator:** Ability to impart complex technical knowledge relating to Zoology clearly and concisely in writing and oral skills.
- **Critical thinker and problem solver:** Ability to have critical thinking and efficient problem-solving skills in the basic areas of Zoology
- **Sense of inquiry:** Capability for asking relevant/appropriate questions relating to issues and problems in the field of Zoology, and planning, executing and reporting the results of an experiment or investigation.
- **Team player/worker:** Capable of working effectively in a diverse classroom, laboratory, industry, and field-based situations.
- **Skilled project manager:** Capable of identifying/mobilizing appropriate resources required for a project and manage a project to completion while observing responsible and ethical scientific conduct; and safety and chemical hygiene regulations and practices.
- **Digitally literate:** Capable of using computers for Bioinformatics and computation and appropriate software for analysis of genomics and proteomics data, and employing modern bioinformatics search tools to locate, retrieve, and evaluate the location and biological annotation genes of different species.

- **Ethical awareness/reasoning:** Capable of conducting their work with honesty and precision, thus avoiding unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, and appreciating environmental and sustainability issues.
- **Lifelong learners:** Capable of self-paced and self-directed learning aimed at personal development and improving knowledge/skill development and reskilling.

Credit Distribution: B.Sc. Zoology including Minor and OE and other courses.

	Type of Courses	III Yr	IV Yrs (Honours)	IV Yrs Research
Major Marathi	Discipline-Specific Courses (DSC)	46	74	66
	Discipline Specific Elective (DSE)	08	16	16
	Skill Enhancement Courses (SEC)	06	06	06
	Vocational Skill Courses (VSC)	08	08	08
	On-Job Training (OJT)	04	08	04
	Field Project (FP)	04	04	04
	Community Engagement and Service (CEP)	02	02	02
	Research project	00	00	12
	Research Methodology	00	04	04
	Indian Knowledge System	02	02	02
	Total (I, II and III Year)	80	124	124
Minor	Minor	20	20	20
Other Courses	Open Elective (OE)/ Multidisciplinary Courses	12	12	12
	Co-Curricular Courses	08	08	08
	Ability Enhancement Courses	08	08	08
	Value Education Courses	04	04	04
	Total	132	176	176

Programme Framework (Courses and Credits): B.Sc. Zoology (Minor)

Sr. No.	Year	Semester	Level	Course Type	Course Code	Title	Credits
1.	I	I	4.5	MNR-1	BS-ZO101	Applied Zoology-I	03
2.	I	II	4.5	MNR-2	BS-ZO201	Applied Zoology-II	03
3.	II	III	5.0	MNR-3	BS-ZO301	Animal Systematics Diversity-I	03
4.	II	IV	5.0	MNR-4	BS-ZO401	Animal Systematics Diversity-II	03
5.	III	V	5.5	MNR-5	BS-ZO501	Developmental Biology	04
6.	III	VI	5.5	MNR-6	BS-ZO601	Animal Physiology	04
							20

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
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Syllabus
B.Sc. Zoology (Minor)

Title of the Course: Animal Systematics and Diversity-I								
Year: II					Semester: III			
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
MNR-3	BS-ZO301 T/P	02	01	03	60	30	70	100

Course Outcomes (COs)

1. Understand the classification and identification of animals.
2. Understand the general physiological mechanism in the lower invertebrates.
3. Learn the economic importance of lower invertebrates.
4. Understand the peculiar characteristics of lower invertebrates.

Detailed Syllabus

A. Theory (02 Credits)

Unit	Name of Topic	Lectures Allotted
1.	Animal Classification and Architecture Modern Classification Systems: Three Kingdom System and Five Kingdom System. Outline Classification of Kingdom Animalia.	(02)
2.	Animal Like Protists: Protozoans General Characters of Protista with particular emphasis on Protozoans. Locomotion in Protozoans: Structure and Function of Cilia, Flagella and Pseudopodia. Economic importance of Protozoa.	(04)
4.	Phylum Porifera Characteristic Features of Phylum Porifera Classification of Phylum Porifera Canal system in Porifera.	(03)
5.	Phylum Cnidaria Characteristic Features of Phylum Cnidaria. Classification of Phylum Cnidaria Polymorphism in Cnidaria. Coral and coral reefs.	(04)

6. **Phylum Platyhelminthes** (03)
Characteristic Features of Phylum Platyhelminthes.
Classification of Phylum Platyhelminthes: Turbellaria, Trematoda, and Cestoda.
Economic importance of Platyhelminthes.
7. **Phylum Aschelminthes** (03)
Characteristic Features of Phylum Aschelminthes.
Classification of Phylum Aschelminthes: Introduction to Pseudocoelomates with particular emphasis on Nematodes.
Economic importance of Nematoda.
8. **Phylum Annelida** (03)
Characteristic Features of Phylum Annelida
Classification of Phylum Annelida
Economic importance of Annelida
9. **Phylum Arthropoda** (04)
Characteristic Features of Phylum Arthropoda
Classification of Phylum Arthropoda
Economic importance of Arthropoda
10. **Phylum Mollusca** 03
Characteristic Features of Phylum Mollusca
Classification of Phylum Mollusca
Economic importance of Mollusca
11. **Phylum Echinodermata** 03
Characteristic Features of Phylum Echinodermata
Classification of Phylum Echinodermata
Economic importance of Echinodermata

Suggested Reading:

1. **Barnes, R.D. (1982). Invertebrate Zoology**, V Edition. Holt Saunders International Edition.
2. **Hadzi, J (1963): The Evolution of Metazoa**, Macmillan Newyork.
3. **Hyman. L. H (1955): The Invertebrates** Vol: I-X, Mcgraw Hill, Newyork.
4. **Modern Text-Book of Zoology, Invertebrates.** By Kotpal, RL., Rastogi and Co., Meerut.
5. **Nigam H.C., Zoology of Nonhordates**, Vishal Publication, Jalandhar-144008.
6. **Kotpal, RL. Rastogi Phylum Protozoa to Echinodermata (series)**, Meerut
7. **Parker T.J and W.A Haswell (1972): A textbook of Zoology**, Vol –I (7th edition by Marshall and Williams) Mcmillan Press Ltd.
8. **Jordan, E.L. and P.S.Verma Invertebrate Zoology**, S. Chand and Co., Ltd. RamNagar, New Delhi.

B. Practical: (01 Credits)

Sr. No.	Title	Practicals Allotted
1.	Museum Study of phylum Protista: <i>Paramecium</i> , <i>Plasmodium</i> , <i>Amoeba</i>	01
2.	Museum Study of Phylum Porifera: <i>Leucosolenia</i> , <i>Sycon</i> and <i>Spongilla</i>	01
3.	Museum study of phylum Cnidaria: <i>Hydra</i> , <i>Obelia</i> and <i>Madripora</i>	01
4.	Museum Study of phylum Platyhelminthes: <i>Planaria</i> , <i>Fasciola hepatica</i> , <i>Taenia solium</i>	01
5.	Museum Study of phylum Aschelminthes: <i>Ascaris lumbricoides</i>	01
6.	Museum Study of phylum Annelida: <i>Nereis</i> , Earthworm and <i>Hirudinaria</i>	01
7.	Museum Study of Phylum Arthropoda: Prawn, Honey bee, Centipede, Millipede, Crab.	01
8.	Museum study of Phylum Mollusca: Pila, Chiton, Bivalve, Octopus.	01
9.	Museum study of Phylum Echinodermata: Sea Star, Sea Urchin, Brittle Star, Sea Cucumber.	01

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**Syllabus
B.Sc. Zoology (Minor)**

Title of the Course: Animal Systematics and Diversity-II								
Year: II					Semester: IV			
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
MNR-4	BS-ZO401 T/P	02	01	03	60	30	70	100

Course Outcomes (COs)

1. To study the general characteristics of chordates
2. To understand the classification of chordates
3. To understand the diversity of chordates.

Detailed Syllabus

A. Theory (02 Credits)

Unit	Name of Topic	Lectures Allotted
1.	Phylum Hemichordata: Characteristic features of Hemichordates Introduction to Classification of Phylum Hemichordata: Enteropneusta and Pterobranchia	(02)
2.	Introduction to phylum Chordata: General features of Phylum Chordata Comparative features of Non-chordates and Chordates. Classification of Phylum Chordata up to Class level.	(03)
3.	Group Protochordata Introduction and characters of Group Protochordata. Classification of Group Protochordata: Subphylum Urochordata, Subphylum Cephalochordata.	(02)
4.	Division Agnatha: Jawless Fishes Introduction to division Agnatha and Gnathostomata	(02)
5.	Superclass: Pisces Introduction and Characters to Superclass Pisces. Classification of Class Chondrichthyes, Class Osteichthyes. Economic Importance of Pisces	(04)
6.	Class: Amphibia Introduction and general characters of class Amphibia.	(04)

	Classification of Class Amphibia Neoteny and Paedogenesis in Amphibia	
7.	Class: Reptilia Characteristic features of Reptiles. Classification of Reptiles Venomous and Non-Venomous Snakes	(04)
8.	Class: Aves Characteristic features of Aves. Classification of Class Aves. Flight Adaptations in Birds	(04)
9.	Class: Mammalia Salient features of Mammalia. Classification of Mammalia Adaptive radiation in Mammals	(04)

B. Practical (01 Credit)

Sr. No.	Title	Practicals
1.	Museum study of Phylum Hemichordata: <i>Balanoglossus</i> ,	01
2.	Museum study of Phylum Hemichordata of group Protochordata: <i>Herdmania</i> , and division Agnatha: <i>Petromyzon</i> . (D)	01
3.	Museum study of Superclass Pisces: <i>Labeo</i> , <i>Scoliodon</i> , <i>Hippocampus</i> .	01
4.	Museum study of Class Amphibia: <i>Salamandra</i> , <i>Rana</i> , <i>Ichthyophis</i> . (D)	01
5.	Study of types of scales in fishes: Placoid scale, Cycloid scale, Ctenoid scale & Ganoid scale.	01
6.	Study of types of tail in fishes: Homocercal, Heterocercal & Diphycercal.	01
7.	Museum Study of Class Reptilia	01
8.	Identification of Venomous & Non – venomous snakes with the help of pictorial taxonomic keys (D)	01
9.	Museum study of Class Aves: Crow, Kingfisher & Duck (D)	01
10.	Study of types of beaks & feet in birds – Any two each (D)	01
11.	Museum study of class Mammalia: Rat, Shrew & Bat. (D)	01

Suggested Readings:

1. **Modern Text-Book of Zoology, vertebrates.** By Kotpal, RL., Rastogi and Co.,
2. **Nigam H.C., Zoology of Chordates**, Vishal Publication, Jalandhar
3. **Jordan, E.L. and P.S. Verma Chordate Zoology**, S. Chand and Co., New Delhi.
4. **Fundamentals of Zoology** Ghosh, Manna NCBA
5. **Biology of Vertebrate H.C. Nigam** Vishal Publishers
6. **Biology of Chordate H.C. Nigam** Vishal Publishers