

**KBC NORTH MAHARSHTRA UNIVERSITY, JALGAON**

**Syllabus for F.Y.B.Sc. ZOOLOGY under CBCS Pattern**

wef June 2022

<b>Semester</b>	<b>Core Course</b>	<b>Structure</b>	<b>Code &amp; Title of the paper</b>	<b>Credit</b>
<b>I</b>	<b>CC A-I</b>	<b>Theory</b>	<b>ZOO 101 Invertebrate Zoology</b>	<b>02</b>
		<b>Theory</b>	<b>ZOO 102 Grasshopper- The Nonchordate</b>	<b>02</b>
		<b>Practical</b>	<b>ZOO 103 Corresponding to Zoo 101 and Zoo 102</b>	<b>02</b>
<b>II</b>	<b>CC A-II</b>	<b>Theory</b>	<b>ZOO 201 Vertebrate Zoology</b>	<b>02</b>
		<b>Theory</b>	<b>ZOO 202 Frog-The Chordate</b>	<b>02</b>
		<b>Practical</b>	<b>ZOO 203 Corresponding to Zoo 201 and Zoo 202</b>	<b>02</b>
<b>Total Credits Sem I &amp; II= 12</b>				

**1 Credit = 30 Periods =50 Marks**

## F.Y.B. Sc. Zoology Semester I

<b>Core Course A-I Theory</b>			
<b>Zoo: 101: Invertebrate Zoology</b>			
	<b>Course objective:</b> <ul style="list-style-type: none"> <li>• To familiarize the student with the basic concept of Invertebrate Zoology.</li> <li>• To understanding of the ecological relationships of the local species.</li> <li>• To identify common and unknown species.</li> <li>• To understand the invertebrate taxonomy and diversity.</li> </ul>	<b>Teaching Hours: 30</b>	<b>Credits: 02</b>
	<b>Learning outcomes:</b> After successful completion of this course, students are expected to: <ul style="list-style-type: none"> <li>• Know the basic concept of Invertebrate Zoology.</li> <li>• Acquire the ecological relationships of the local species.</li> <li>• Know common and unknown invertebrate species.</li> <li>• Understand of the – Invertebrate phyla, anatomy, natural history, collection, preservation, behavior and evolution.</li> </ul>		
Unit	Name of Topic	Lectures	Marks:
		<b>45</b>	<b>60</b>
<b>Unit-1</b>	Introduction to the animal kingdom. <b>A) Porifera:</b> General characteristics and classification up to class. <b>B) Cnidaria:</b> General characteristics and classification up class. <b>C) Ctenophora:</b> General characteristics and classification up to class.	<b>08</b>	<b>12</b>
<b>Unit-2</b>	<b>A) Platyhelminthes:</b> General characteristics and classification up to class. <b>B) Aschelminthes:</b> General characteristics and classification up to class. <b>C) Annelida:</b> General characteristics and classification up to class.	<b>10</b>	<b>12</b>
<b>Unit-3</b>	<b>A) Arthropoda:</b> General characteristics and classification up to class with two examples. <b>B) Mollusca:</b> General characteristics and classification up to class with two examples.	<b>10</b>	<b>12</b>
<b>Unit- 4</b>	<b>A) Echinodermata:-</b> General characteristics and classification up to class with two examples. <b>B) Hemichordata:-</b> General characteristics and classification up to class with two examples.	<b>07</b>	<b>10</b>
<b>Unit- 5</b>	<b>General Topics</b> <ul style="list-style-type: none"> <li>• Canal system in Porifera.</li> <li>• Polymorphism in Coelenterates.</li> </ul>	<b>10</b>	<b>14</b>

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| <ul style="list-style-type: none"> <li>• Parasitic adaptation in Flat worm.</li> <li>• Metamerism in Annelida.</li> <li>• Metamorphosis in insect.</li> <li>• Economic importance in Mollusca.</li> <li>• Water vascular system in Echinodermata.</li> </ul> |  |  |
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**Suggested Readings**

- Kershaw, D. R. :Animal Diversity, Redwood Burn Ltd, Trowbridge
- Parker J. and Haswell, W.: Text-Book of Zoology, ELBS Edition
- Vidyarthi: Text-Book of Zoology - Agrasia Publishers, Agra.
- Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
- Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science
- Kotpal R L (2009): Modern textbook of Zoology Invertebrates,Rastogi Publication.
- Hall B.K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.
- Kotpal R.L.: Protozoa to Echinodermata series.
- Prasad S.N.: Life of Invertebrates, Vikas Publishing house, New Delhi.
- Jorden,E.L.: The Invertebrates, S.C. Chand, New Delhi.

## F.Y.B. Sc. Zoology Semester I

<b>Core Course A-I Theory</b>			
<b>Zoo: 102: Grasshopper-The Nonchordate</b>			
	<b>Course objective:</b> <ul style="list-style-type: none"> <li>• To provide thorough knowledge about external morphological features of grasshopper</li> <li>• To develop an understanding about internal structural and functional details of grasshopper including its reproductive system and life cycle.</li> </ul>	<b>Teaching Hours: 30</b>	<b>Credits: 02</b>
	<b>Learning outcomes:</b> After successful completion of this course, students are expected to: <ul style="list-style-type: none"> <li>• Acquire knowledge about external morphological features of grasshopper</li> <li>• Understand internal structural and functional details of grasshopper</li> <li>• Develop deeper knowledge about reproduction and life cycle of grasshopper</li> </ul>		
<b>Unit</b>	<b>Study of Grasshopper (<i>Poekilocerus pictus</i>) with respect to following points</b>	<b>Lectures 45</b>	<b>Marks: 60</b>
<b>Unit-1</b>	<b>1.1 External Characters and sexual dimorphism</b> <ul style="list-style-type: none"> <li>a) Shape, size and Colour</li> <li>b) Division of the body</li> <li>c) Sexual dimorphism</li> </ul> <b>1.2 Digestive system:</b> <ul style="list-style-type: none"> <li>a) Mouth parts</li> <li>b) Alimentary canal, Digestive glands,</li> <li>c) Food, feeding and Digestion</li> </ul>	<b>08</b>	<b>12</b>
<b>Unit-2</b>	<b>Respiratory system:</b> <ul style="list-style-type: none"> <li>a) Tracheal system</li> <li>b) Types of spiracles</li> <li>c) Mechanism of respiration</li> </ul>	<b>09</b>	<b>12</b>
<b>Unit-3</b>	<b>Circulatory system:</b> <ul style="list-style-type: none"> <li>a) Type of circulatory system</li> <li>b) Heart, sinuses</li> <li>c) Haemolymph - Composition and functions</li> </ul>	<b>10</b>	<b>12</b>
<b>Unit- 4</b>	<b>4.1 Nervous system :</b> Brain, nerve cord and sense organs <b>4.2 Excretion</b> in grasshopper	<b>06</b>	<b>10</b>
<b>Unit- 5</b>	<b>5.1 Male &amp; Female Reproductive system</b> <b>5.2 Life cycle</b> of grasshopper <b>5.3 Economic importance</b> of grasshopper	<b>12</b>	<b>14</b>
<b>Suggested Readings</b>			

- Parker J. and Haswell, W.: Text-Book of Zoology, ELBS Edition
- Vidyarthi: Text-Book of Zoology - Agrasia Publishers, Agra.
- Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
- Kotpal R L (2009): Modern textbook of Zoology Invertebrates, Rastogi Publication.
- Kotpal R.L.: Arthropods
- Prasad S.N.: Life of Invertebrates, Vikas Publishing house, New Delhi.
- Jordan, E.L.: The Invertebrates, S.C. Chand, New Delhi.
- Prof P S Lohar *et al*: FYBSz Zoo 101 & 102: Atahrva Publication, Jalgaon

## F.Y.B. Sc. Zoology Semester I

<b>Core Course A-I Practical</b>			
<b>Zoo 103 (Corresponding to Zoo 101 &amp; Zoo 102)</b>			
<b>Zoo: 101: Invertebrate Zoology and Zoo 102: Grasshopper-The Nonchordate</b>			
	<b>Course objective:</b> <ul style="list-style-type: none"> <li>• To understand habit, habitat and taxonomic status of invertebrate animals</li> <li>• To explain the basic aspects of structural and functional details of grasshopper</li> </ul>	<b>Teaching Hours: 30</b>	<b>Credits: 02</b>
	<b>Learning outcomes:</b> After successful completion of this course, students are expected to: <ul style="list-style-type: none"> <li>• Know the basic concept of Invertebrate Zoology.</li> <li>• Understand common and unknown invertebrate species.</li> <li>• Acquire practical knowledge about structural and functional aspects of grasshopper</li> </ul>		
<b>Part</b>	<b>Title of Practical</b>	<b>Lectures 45</b>	<b>Marks: 60</b>
<b>A</b>	<b>Study of the following Invertebrate specimens :</b> <i>Amoeba, Euglena, Plasmodium, Paramecium, Sycon, Hyalonema, and Euplectella, Obelia, Physalia, Aurelia, Tubipora, Metridium, Taeniasolium, Male and female Ascaris lumbricoides, Aphrodite, Nereis, Pheretima, Hirudinaria, Palaemon, Cancer, Limulus, Palamnaeus, Scolopendra, Julus, Periplaneta, Apis, Chiton, Dentalium, Pila, Unio, Loligo, Sepia, Octopus, Pentaceros, Ophiura, Echinus, Cucumaria and Antedon.</i>	<b>15</b>	<b>20</b>
<b>B</b>	<b>Study of phylum specific characteristic features:</b> <ul style="list-style-type: none"> <li>• Canal system in Porifera.</li> <li>• Polymorphism in Coelenterates.</li> <li>• Parasitic adaptation in Flat worm.</li> <li>• Metamerism in Annelida.</li> <li>• Metamorphosis in insect.</li> <li>• Economic importance in Mollusca.</li> <li>• Water vascular system in Echinodermata</li> </ul>	<b>10</b>	<b>10</b>
<b>C</b>	<b>Study of Grasshopper with respect to following</b> <ul style="list-style-type: none"> <li>• External characters and sexual dimorphism</li> <li>• Mounting of mouth parts, wings, legs, trachea and spiracles, gizzard, malpighian tubules ootheca</li> <li>• Digestive system</li> <li>• Circulatory system</li> <li>• Nervous system</li> <li>• Male and female reproductive system</li> <li>• Life cycle of grasshopper</li> </ul>	<b>20</b>	<b>30</b>
<b>Suggested Readings</b>			

- Parker J. and Haswell, W.: Text-Book of Zoology, ELBS Edition
- Vidyarthi: Text-Book of Zoology - Agrasia Publishers, Agra.
- Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
- Kotpal R L (2009): Modern textbook of Zoology Invertebrates, Rastogi Publication.
- Kotpal R.L.: Arthropods
- Prasad S.N.: Life of Invertebrates, Vikas Publishing house, New Delhi.
- Jordan, E.L.: The Invertebrates, S.C. Chand, New Delhi.
- Prof P S Lohar *et al*: Practical Handbook for FYBSz Zoo 103: Atahrva Publication, Jalgaon

## F.Y.B.Sc. Zoology Semester II

<b>Core Course A-II Theory</b>			
<b>Zoo: 201: Vertebrate Zoology</b>			
	<p><b>Course objective:</b></p> <ul style="list-style-type: none"> <li>➤ To understand General Characters, habit, habitat and distribution of vertebrate animals.</li> <li>➤ To understand the classification of vertebrate animals.</li> <li>➤ To learn about general topics like               <ul style="list-style-type: none"> <li>● Accessory Respiratory Organs</li> <li>● Migration in Fishes</li> <li>● Metamorphosis in frog and Parental care in Amphibians</li> <li>● Poisonous and non-poisonous snakes, Importance of snake venom</li> <li>● Flight adaptations in birds, Migration in birds</li> <li>● Origin and Evolution of mammals</li> </ul> </li> </ul>	<b>Teaching Hours: 30</b>	<b>Credits: 02</b>
	<p><b>Learning outcomes:</b></p> <p>After successful completion of this course, students are expected to:</p> <ul style="list-style-type: none"> <li>• Gain the knowledge of the systematic position, habit and habitat of vertebrate animals</li> <li>• Acquire the knowledge about classification of vertebrates</li> <li>• Understand the general topics related to vertebrate animals.</li> </ul>		
Unit	Name of Topic	Lectures <b>45</b>	Marks: <b>60</b>
<b>Unit-1 A</b>	<b>Introduction</b> , General characters of Chordates	<b>08</b>	<b>12</b>
<b>Unit-1 B</b>	<b>Protochorda</b> 1.1 General characters, habit, habitat and distribution of Hemichordates, Urochordates and Cephalochordates		
<b>Unit-1 C</b>	<b>Agnatha</b> 1.2 General characters, habit, habitat and distribution of Agnatha 1.3 Classification of cyclostomes up to classes		
<b>Unit-2 A</b>	<b>Pisces</b> 2.1 General characters, habit, habitat and distribution, 2.2 Classification up to orders;	<b>10</b>	<b>12</b>
<b>Unit-2 B</b>	<b>Amphibia</b> 2.3 General characters, habit, habitat and distribution 2.4 Classification up to orders		
<b>Unit-3 A</b>	<b>Reptiles</b> 3.1 General characters, habit, habitat and distribution	<b>10</b>	<b>12</b>



<b>Unit-3 B</b>	3.2 Classification up to orders; <b>Aves</b> 3.3 General characters, habit, habitat and distribution 3.4 Classification up to orders		
<b>Unit- 4</b>	<b>Mammals</b> 4.1 General characters, habit, habitat and distribution 4.2 Classification up to orders;	<b>07</b>	<b>10</b>
<b>Unit- 5</b>	<b>General Topics</b> a) Accessory Respiratory Organs b) Migration in Fishes c) Metamorphosis in frog and Parental care in Amphibians d) Poisonous and non-poisonous snakes, Importance of snake venom e) Flight adaptations in birds, Migration in birds f) Origin and Evolution of mammals	<b>10</b>	<b>14</b>
<b>Suggested Readings</b>	<ul style="list-style-type: none"> <li>• Young, J. Z. (2004). <i>The Life of Vertebrates</i>. III Edition. Oxford university press.</li> <li>• Grove, Newell and Carthy . Animal Biology University Tutorial Press Ltd. London</li> <li>• Kotpal R L (2009): <i>Modern textbook of Zoology Vertebrates</i>, RastogiPublicationa. .</li> <li>• Lal S.S. (1996): <i>Textbook of Practical Zoology Vertebrates</i>, Rastogi Publications</li> <li>• Varma P. S. A Manual of Practical Zoology Chordates. S. Chand &amp; Company Ltd. Delhi</li> <li>• Dhama&amp;Dhama Chordate Zoology R. Chand &amp; Co. New Delhi</li> <li>• Jayaraman : Fishes of India.</li> <li>• Salim Ali, : Indian Birds.</li> <li>• Vishwapremi K.K., : Economic Zoology (AkashdeepPub.House,New Delhi).</li> <li>• Dalela, R.C. : A text book of Chordate Zoology, (Jai Prakash Nath publications, Meerut.).</li> <li>• Newman, H.H. : The phylum Chordate, (Satish Book Enterprise, Agra).</li> <li>• Jordon, E.L.: <i>Vertebrate Zoology</i>, (S. Chand and Co., New Delhi.).</li> <li>• Parker and Haswell Vol. II. A. Z. T. B. S. Publishers and distributors, New Delhi.</li> </ul>		

## F.Y.B.Sc. Zoology Semester II

<b>Core Course A-II Theory</b>			
<b>Zoo: 202: Frog-The Chordate</b>			
	<b>Course objective</b> <ul style="list-style-type: none"> <li>• To understand habit, habitat and taxonomic status of vertebrates</li> <li>• To explain the basic aspects of structural and functional details of Frog</li> </ul>	<b>Teaching Hrs: 30</b>	<b>Credits: 02</b>
	<b>Learning outcomes</b> After successful completion of this course, students are expected to: <ul style="list-style-type: none"> <li>• Understand the systematic position, habit and habitat of Frog</li> <li>• Acquire the knowledge about structural and functional details about Frog.</li> </ul>		
<b>Unit</b>	Study of Frog ( <i>Hoplobatrachus tigerinus</i> ) with respect to following points	<b>Lectures 45</b>	<b>Marks: 60</b>
<b>1</b>	<b>4.2 External Characters and sexual dimorphism</b> d) Shape, size and Colour e) Division of the body f) Sexual dimorphism	<b>08</b>	<b>12</b>
	<b>4.3 Digestive system:</b> d) Alimentary canal e) Digestive glands, f) Food, feeding and g) Digestion		
<b>2</b>	<b>2.1 Respiratory system:</b> a) Types and process of respiration	<b>08</b>	<b>12</b>
	<b>2.2 Circulatory system:</b> a) Heart, b) Arterial system, c) Venous system, d) Blood- Composition and functions		
<b>3</b>	<b>3.1 Nervous system:</b> a) Brain, b) Ventricles and c) Spinal cord	<b>12</b>	<b>12</b>
	<b>3.2 Sense organs:</b> a) Eye and b) Ear		
	<b>3.3 Excretory system:</b> a) Kidney b) Ureters c) Urinary bladder d) Cloaca		
<b>4</b>	<b>Reproductive system:</b> a) Male Reproductive system:	<b>10</b>	<b>12</b>

	Testes, Vasaefferntia, Urino-genital duct and Cloaca b) Female Reproductive system: Ovaries, Oviduct, Cloaca		
<b>5</b>	<b>Frog Development:</b> a) Structure of egg and sperm, b) Amplexus and Fertilization c) Cleavage, Tadpoles d) Metamorphosis	<b>7</b>	<b>12</b>
<b>Suggested Readings</b>			
<ul style="list-style-type: none"> <li>➤ Robert Rugh: The Frog: Its reproduction and development - Tata McGraw Hill Edition, New Delhi.</li> <li>➤ Ganguly, B.B., Sinha, A.K., Adhikari, S.: Biology of Animals - New Central Book Agency, Kolkata</li> <li>➤ Bhamrah, MS and Juneja, K.: Introduction to Amphibia - Amol Publications, Delhi.</li> <li>➤ Young, J. Z.:Life of Vertebrates - III Edition, Clarendon Press, London</li> <li>➤ Goodnight and others: General Zoology, IBH Publishing Co.</li> <li>➤ Prasad, ASN. : Life of Vertebrates - Vikas Publishing House, New Delhi</li> <li>➤ Prasad, S. N. and Kashyap V.: Textbook of Vertebrate Zoology - New Age India Publishers, New Delhi</li> <li>➤ Kotpal, R. L: Modern Text-Book of Zoology, Vertebrates, Rastogi and Co., Meerut.</li> <li>➤ Jhingran, JG.: Fish and Fisheries of India, Hindustan Publishing corporation, New Delhi</li> <li>➤ Kershaw, D. R. :Animal Diversity, Redwood Burn Ltd, Trowbridge</li> <li>➤ Parker J. and Haswell, W.: Text-Book of Zoology, ELBS Edition</li> <li>➤ Vidyarthi: Text-Book of Zoology - Agrasia Publishers, Agra.</li> <li>➤ Jordan E.L and Verma P.S.: Chordate Zoology , S. Chand and Co., New Delhi</li> <li>➤ Nigam, HC and Sobti, R.: Functional Organization of Chordate (parts I and II), S. Chand and Co., New Delhi</li> </ul>			

## F.Y.B.Sc. Zoology Sem II

Core Courses A-II			
Zoo - 203: Practical II (Corresponding to Zoo 201 & 202)			
Zoo 201: Vertebrate Zoology & Zoo 202: Frog-The Chordate			
	<p><b>Course objective:</b></p> <ul style="list-style-type: none"> <li>➤ To acquire the practical skill about classification of Vertebrate animals</li> <li>➤ To perform mountings of various significant parts of Vertebrate animals like                             <ul style="list-style-type: none"> <li>➤ Fins and scales of fishes.</li> <li>➤ beaks and feet in birds</li> <li>➤ poisonous and non-poisonous snakes</li> </ul> </li> <li>➤ To understand the concept of systematics or taxonomic features of vertebrate animals.</li> </ul>	<p><b>Teaching Hours: 30</b></p>	<p><b>Credits: 02</b></p>
	<p><b>Learning outcomes:</b> After successful completion of this course, students are expected to:</p> <ul style="list-style-type: none"> <li>• Enlighten themselves with knowledge related to systematic features of vertebrate animals.</li> <li>• Enrich themselves with understandings of accessory organs.</li> <li>• Know the poisonous and nonpoisonous snakes.</li> </ul>		
	<b>Title of Practical</b>	<b>Lectures 60</b>	<b>Marks 60</b>
	<ul style="list-style-type: none"> <li>• Study of external morphology body forms, fins and scales of the fishes.</li> <li>• Systematic position, habit and habitat of <i>Balanoglossus</i>(Hemichordata), <i>Herdmania</i>, <i>Branchiostoma</i>, <i>Petromyzon</i>, <i>Sphyrna</i>, <i>Pristis</i>, <i>Torpedo</i>, <i>Labeo</i>, <i>Exocoetus</i>, <i>Anguilla</i>, <i>Ichthyophis/Ureotyphlus</i>, <i>Salamandra</i>, <i>Bufo</i>, <i>Hyla</i>, <i>Chelone</i>, <i>Hemidactylus</i>, <i>Chamaeleon</i>, <i>Draco</i>, <i>Vipera</i>, <i>Naja</i>, <i>Crocodylus</i>, <i>Gavialis</i>, Any six common birds from different orders, <i>Sorex</i>, Bat, <i>Funambulus</i>, <i>Loris</i></li> <li>• Economic importance of two animals from each class.</li> <li>• Study of beaks and feet in birds.</li> <li>• Identification of poisonous and non-poisonous snakes.</li> </ul> <p><b>Study of Frog with the help of diagrams / chart / model / simulations / etc.</b></p> <p>a) External characters and sexual dimorphism b) Digestive system</p>		

	<p>c) Respiratory system  d) Circulatory system – Arterial and Venous system  e) Excretory and Reproductive system – Male and Female  f) Brain – Dorsal and Ventral view  g) Permanent slides of – Sperm, Egg, Blastula and Gastrula, Tadpole Larvae</p> <ul style="list-style-type: none"> <li>• Report on compulsory visit to a Zoo/Sanctuaries.</li> </ul>		
<p><b>Suggested Readings</b></p>	<ul style="list-style-type: none"> <li>• Kotpal R L (2009): Modern textbook of Zoology Vertebrates, Rastogi Publications.</li> <li>• Lal S.S. (1996): Textbook of Practical Zoology Vertebrates, Rastogi Publications</li> <li>• Varma P. S. A Manual of Practical Zoology Chordates. S. Chand &amp; Company Ltd. Delhi</li> <li>• Jayaraman : Fishes of India.</li> <li>• SalimAli : Indian Birds.</li> <li>• Dalela, R.C.: A text book of Chordate Zoology, (Jai Prakash Nath publications, Meerut.).</li> </ul>		

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**FYBSc Zoology (CBCS Pattern)**

Equivalence of courses in old syllabus 2018-19 to new syllabus 2022-23

<b>Old Courses in 2018-19</b>	<b>New course in 2022-23</b>
ZOO-101: Animal Diversity I	ZOO 101: Invertebrate Zoology
ZOO-101: Animal Diversity II	ZOO 102: Grasshopper- The Nonchordate
ZOO-201: Comparative Anatomy of Vertebrates	ZOO 201: Vertebrate Zoology
ZOO-202: Developmental Biology of Vertebrates	ZOO 202: Frog- The Chordate
ZOO-103 (IstSem) and ZOO-203 (IIndSem): Practical Courses	ZOO-103 (IstSem) and ZOO-203(IIndSem): Practical Courses